PB83-192815

Study of Selected State and Local Air Toxics Control Strategies

Radian Corp.
Durham, NC

Prepared for

Environmental Protection Agency
Research Triangle Park, NC

Oct 82

U.S. Department of Commerce
National Technical Information Service
NTIS

PB83-192815

United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park NC 27711

EPA 450/5-82-006
October 1982

Air

EPA

Study of Selected State and Local Air Toxics Control Strategies

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SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA 450/5-82-006	**2.**	**3. RECIPIENT'S ACCESSION NO.** PB83 192815
4. TITLE AND SUBTITLE Study of Selected State and Local Air Toxics Control Strategies		**5. REPORT DATE** October 1982
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Alice S. Pelland, Suzanne J. Call, Glynda E. Wilkins		**8. PERFORMING ORGANIZATION REPORT NO.** DCN #82-240-016-21-10
9. PERFORMING ORGANIZATION NAME AND ADDRESS Radian Corporation 3024 Pickett Road Durham, North Carolina 27705		**10. PROGRAM ELEMENT NO.**
		11. CONTRACT/GRANT NO. EPA Contract No. 68-02-3513
12. SPONSORING AGENCY NAME AND ADDRESS Pollutant Assessment Branch Office of Air Quality Planning and Standards U.S. Environmental Protection Agency Research Triangle Park, NC 27711		**13. TYPE OF REPORT AND PERIOD COVERED** Final
		14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This project was initiated with the objective of providing a report describing state and local programs for controlling toxic air pollutants. The report is designed to serve as a resource for agencies who wish to develop air toxics control strategies. Studies were made of air toxics programs in Michigan, New Jersey, New York, Kentucky, Texas, California, Illinois, and Philadelphia.

The report consists of a summary comparing the eight programs and a detailed description of each program. The most significant finding of the study was that although the approaches used in the air toxics programs studied were different, each is workable. Despite the differences, commonalities among the eight programs include the purpose for their development and the general functions accomplished by the programs. Development of all eight programs was initiated as a result of the recognition of potential adverse health effects resulting from exposure to toxic substances in the ambient air. The programs studied have four general functions in common: (1) air toxics control implemented via existing criteria pollutant permitting system, (2) collection of information on substances that will be emitted from sources being permitted, (3) determination of the quantity of toxic emissions allowable, and (4) conservation of agency resources in order to focus efforts on the most hazardous emissions of air toxics.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air Pollution Control: Michigan, New Jersey, Philadelphia, New York, Kentucky, California, Texas, Illinois Toxic Air Contaminants	Air Pollution Control Hazardous/Toxic Emissions	

18. DISTRIBUTION STATEMENT Unlimited	**19. SECURITY CLASS *(This Report)*** Unclassified	**21. NO. OF PAGES** 230
	20. SECURITY CLASS *(This page)* Unclassified	**22. PRICE**

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

DCN #82-240-016-21-10

EPA 450/5-82-006
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Preface

Several State and local air pollution control agencies have developed or are now developing regulatory programs, apart from Federal activities, that deal with toxic air pollutants. In response to queries from EPA Regional Offices and conversations with some state/local air pollution personnel, the Pollutant Assessment Branch (in EPA's Office of Air Quality Planning and Standards) undertook a review of some of the more advanced of these programs in order to apprise others of the various approaches in use.

The information and programs described here have been neither approved nor disapproved by EPA. The opinions expressed are those of the individual State/local program officials. The purpose of this document is to present factual data only. It should be noted that some of the programs have continued to develop since this report was prepared, and therefore it should be read as a "snapshot" in time.

ABSTRACT

This project was initiated with the objective of providing a report describing state and local programs for controlling toxic air pollutants. The report is designed to inform other agencies about various State/local air toxics control programs in use. Studies were made of air toxics programs in Michigan, New Jersey, New York, Kentucky, Texas, California, Illinois, and Philadelphia.

The report consists of a factual summary comparing the eight programs and a detailed description of each program. The programs studied have four general functions in common: (1) air toxics control implemented via existing criteria pollutant permitting system, (2) collection of information on substances that will be emitted form sources being permitted, (3) determination of the quantity of toxic emissions allowable, and (4) conservation of agency resources in order to focus efforts on the most hazardous emissions of air toxics.

This report was submitted in fulfillment of Contract No. 68-02-3513 by the Radian Corporation under the sponsorship of the U. S. Environmental Protection Agency. This report covers a period from April 1982 to September 1982 and work was completed in October 1982.

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ACKNOWLEDGEMENTS

The cooperation of the air pollution control staff members from Michigan, Philadelphia, New York, Kentucky, California, Texas and Illinois is gratefully acknowledged. Their comments on the draft report were very helpful. We particularly appreciate the help of Dr. George Su (Michigan Department of Natural Resources), Gary Pierce (New Jersey Department of Environmental Protection), Clem Lazenka (Philadelphia Department of Public Health), Tom Cashman (New York Department of Environmental Conservation), and Norman Schell (Kentucky Natural Resources and Environmental Protection Cabinet) for coordinating our interviews with their respective air toxics staffs.

PART I
SECTION 1
INTRODUCTION

PURPOSE

This report is the result of a study of state and local strategies for controlling emissions of toxic air pollutants. The study was undertaken by the Environmental Protection Agency's (EPA) Office of Air Quality Planning and Standards to describe approaches used by state and local agencies in developing and implementing air toxics control policies. For various reasons, several state and local agencies have established their own programs to control emissions of toxic air pollutants. Furthermore, other states are considering the development of an air toxics regulatory program. This report is designed to inform other agencies about various State/local air toxic control programs in use or under develoment.

METHODOLOGY

Five air toxics programs were studied in detail with three additional programs being examined to a lesser extent. The detailed studies consisted of reviewing printed material describing the programs and meeting with the agency staffs involved in air toxics control for discussion of each approach.

The detailed studies were made of programs in the states of Michigan, New Jersey, New York, and Kentucky and in the city of Philadelphia. These agencies were chosen for four main reasons. First, the control programs were in place or well underway to regulating emissions of air toxics. Michigan, New Jersey, New York, and Kentucky have programs in place and functioning. Philadelphia has planned its approach to control and is working on components of implementation of that approach. The second reason for selecting these five is that they represent a variety of approaches to air toxics control. For example, Michigan, Philadelphia, New York, and Kentucky all use different methods to establish acceptable ambient concentrations and prohibit a source's contribution to the ambient concentration from exceeding an acceptable level. New Jersey, however, requires state-of-the-art engineering controls and does not establish an acceptable ambient concentration. Similarly, New Jersey and Philadelphia consider specific lists of substances in their air toxics programs while Michigan, New York, and Kentucky evaluate the potential toxicity of any substance emitted.

The third reason for selecting these programs was that they represented different levels of activity. Kentucky, for example, has far fewer industrial sources than do Michigan, New Jersey or New York. Furthermore, Philadelphia's program represents a local agency's control approach, lending a different perspective from the state programs.

The final reason for selecting these five programs was that they have different types of administrative organizations and legislative or administrative authority. New York, for example, issues permits to sources of air toxics from nine regional offices, while Michigan, New Jersey, and Kentucky all issue permits from one central office. In regard to legislative or administrative authority, New Jersey, Kentucky, and Philadelphia have rules that specifically address toxics while Michigan and New York rely on a general authority for controlling air pollution.

As mentioned previously, shorter studies were done of three other programs: Texas, California, and Illinois. Information on air toxics control in these states was collected by telephone and by review of published descriptions of the programs. California and Illinois are developing air toxics control policies and are both considering approaches encompassing significant differences from the other approaches studied. Texas has had an air toxics program in place for several years, and, with California, adds a broader geographical perspective to the study.

The information contained in this report has been reviewed by members of the state and local agencies whose programs are described.

ORGANIZATION

This report is divided into two parts. Part 1, the Executive Summary, conveys the important findings of the study and contains a summary comparing and contrasting the eight programs. Part 2 consists of a description of each of the eight programs.

Each of the descriptions addresses the same general topics: background information, an overview of the regulatory approach, a more detailed discussion of parts of the regulatory program, and a discussion of various administrative issues. The background information sections of the descriptions include discussions on why the particular programs were initiated, the enabling legislation, and the staff organizations for air toxics control. The overview sections give brief summaries of how the total programs function followed by detailed discussions of various parts of each program. Topics covered in these two sections differ among the eight programs because the programs themselves are different. The final sections on administrative issues discuss topics such as involvment by the public and industry, operation of the programs to date, and the levels of staff effort required to develop and administer the programs. Also included in the sections on administrative issues are evaluations made by the various agency staffs of their own programs. The description of New Jersey's program includes an additional section on air toxics research activities in New Jersey. Each description includes a list of agency contacts who can provide additional information about a particular program. The index at the end of the entire report is provided so readers can easily refer to specific topics in the summary or in various program descriptions.

SECTION 2

CONCLUSIONS

This study demonstrates that there are a variety of approaches used in designing and implementing air toxics control programs in the States. The development of a particular approach is undoubtedly influenced by many factors. Some of these factors which became apparent during the study included the level of funding devoted to regulating air toxics, the disciplines represented on the air agency staff, the number of industrial sources subject to the regulations, and the public concerns expressed.

Despite the differences, there are several commonalities among the eight control programs, including the underlying purposes for their development and the general functions accomplished. Development of all eight approaches to controlling emissions of toxic air pollutants was initiated as a result of the recognition of potential adverse health effects resulting from exposure to various toxic substances in the ambient air. In some cases, there was a specific legislative mandate to control air toxics and in other cases, the authority for such control was based on a general air pollution control mandate. In all eight cases, however, the legislative authority referenced the need to protect public health.

All of the programs have four basic functions in common. The first common function is the mechanism for implementing the control of air toxics. All of the programs studied have integrated or plan to integrate their air toxics permitting with their criteria pollutant permitting system. The second function common to all the approaches is the collection of information concerning substances that will be emitted from sources being permitted and the rates at which the substances will be emitted. This information is usually supplied by permit applicants, but New Jersey and Philadelphia have used questionnaires to solicit such information about existing sources.

The third common function is the development of a method to determine the quantity of toxic emissions allowable. In New Jersey, the allowable quantity of toxic emissions is determined by state-of-the-art controls which are required for all sources to which the toxics regulations apply. The other programs use or are considering various ways to determine acceptable ambient levels of toxic substances. In some cases, no detectable amount of the particular substance is allowed.

The final common function is the development of ways to conserve agency resources in order to focus efforts on the most hazardous emissions of air toxics. Some programs regulate a specific list of substances and one is considering limiting the program to certain industries. Another method which conserves resources is the use of certain screening procedures. Such procedures shorten the permitting process by identifying sources that do not pose a significant hazard and sources that need further study to determine the significance of the hazard.

SECTION 3

SUMMARY

This section summarizes the major features of the eight programs studied and compares and contrasts the various approaches. Table 1 summarizes many of the comparisons made in this section in a graphical form. The descriptions in this section are intended to highlight major similarities and differences. Some points have been simplified, in the interest of summarizing. In some cases, a particular program will be cited in order to give an example, while other programs that share the characteristic in question are not always listed. The reader is urged to refer to major points of interest in the more detailed descriptions in Part II of this report. This summary section is organized using the same format as the descriptions of the individual programs in Part II.

BACKGROUND INFORMATION

Initiation of Air Toxics Control

Public concern over the potential health effects of toxic air pollutants was the central factor that led to development of all eight air toxics programs studied. In Michigan, the concern was sparked by specific incidents of environmental damage involving toxic substances. Philadelphia and New Jersey cited concern over incidences of cancer that seemed unusually high.

In addition to health considerations, Michigan, New York and Illinois noted the need for a well-defined, consistent system for the control of toxic air pollutants. Agencies in these states felt that such a system

TABLE 1. COMPARISON OF SELECTED AIR TOXICS CONTROL STRATEGIES

	PROGRAMS							
	VISITED FOR STUDY					RESEARCHED, NOT VISITED		
	MI	NJ	PHIL	NY	KY	TX	CA	IL
I. Background Information								
A. Legislative Authority								
1. Legislative or administrative authority specifically addresses air toxics.		✓	✓	✓	✓		●	
2. Air toxics policy is a guideline rather than a promulgated standard.	✓		✓	✓	✓	✓	●[a]	●
B. Function and Scope								
1. Air toxics control accomplished by permitting system coordinated with criteria pollutant permitting.	✓	✓	●		✓	✓	●	●
2. Regulates new and modified sources only.	✓				✓	✓		
3. Has a permit renewal system for air toxics.		✓	●	✓			●	●
4. Has a minimum emissions cutoff for applying air toxics policy.		✓				✓		
5. Air toxics policy covers only a specific list of substances.		✓	✓				●	●
II. Permitting Considerations								
A. Acceptable Concentrations								
1. Establishes an acceptable ambient concentration.	✓		✓	✓	✓	✓	●	●
2. Uses TLV's to establish acceptable level.	✓		✓	✓	✓	✓		●
3. Has additional control requirements for carcinogenic substances.	✓			✓			●	
4. Uses quantitative risk assesment.	✓			✓	✓		●	●
B. Emission Inventories								
1. Accumulates inventory data from permit applications.		✓		✓	✓	✓	●	
2. Inventories existing sources at initiation of air toxics program.		✓	✓					

	PROGRAMS							
	VISITED FOR STUDY					RESEARCHED, NOT VISITED		
	MI	NJ	PHIL	NY	KY	TX	CA	IL
C. Estimation of Source Emissions								
1. Uses dispersion modeling to relate source's emission rate to acceptable ambient concentration.	✓		✓	✓	✓	✓	●	●
2. Uses a screening process to determine if detailed dispersion modeling is necessary.	✓			✓	✓			●
D. Permitting								
1. BACT automatically required for some or all sources.[b]	✓	✓		✓		✓	●	
2. Establishes minimum stack requirements in addition to BACT.		✓						
E. Monitoring								
1. Permits may require stack or ambient monitoring.	✓	✓	●	✓	✓	✓	●	
2. Conducts ambient monitoring of toxics for background data.		✓	●	✓		✓	✓	
III. Administrative Issues								
A. Consults an outside group of experts.			✓		✓	✓	✓	

✓: currently exists ●: planned or proposed for use

[a] California will promulgate standards if sufficient information on a substance is available but staff anticipates that most substances will have guidelines.

[b] Determined on a case-by-case basis with approval by the control agency.

would enable industries subject to control requirements to plan more effectively.

Enabling Legislation

There were two general types of enabling legislation for the regulation of air toxics represented among the eight programs:

- general environmental legislation that prohibits emissions of air pollutants that are injurious to life or the enjoyment of life and property, and

- legislation which specifically requires the control of air toxics.

Agencies administering air toxics control programs in Michigan, New York, Kentucky, Texas, and Illinois all derive their authority from general legislation, while Philadelphia's and New Jersey's enabling legislation specifically requires the development of programs to control toxic air contaminants. California has proposed legislation specifically related to control of air toxics. In all eight programs studied, general legislation passed several years ago established air pollution control administrative bodies, giving them the authority to promulgate rules and regulations and to issue permits.

Administrative rules promulgated by the control organizations in New Jersey, Kentucky, and Philadelphia specifically address air toxics, while rules passed by other control agencies repeat the same general air pollution control authority granted in each state's respective legislation. Some of the rules are very specific, listing certain toxic substances to be controlled. New Jersey's rules list the 11 toxic substances that will be controlled and require state-of-the-art control for sources of the 11 substances. Similarly, Philadelphia's regulations list 99 substances covered by the control program and establish the authority to limit or prohibit emissions of those substances via standards and required control measures. Kentucky's Administrative rules require that sources control "potentially hazardous matter and toxic substances," but unlike New Jersey, Kentucky's rules do not list a specific group of substances.

In all programs except for New Jersey's and to some degree California's, the administrative organizations rely (or plan to rely where programs are not yet implemented) on guidelines for issuing permits rather than on promulgated rules or regulations. For example, Michigan and New York have specific guidelines on control of air toxics, but these guidelines have not been promulgated by the air pollution control agencies. California may promulgate ambient air quality standards for some toxic substances emitted from many diverse sources. Otherwise, California is considering a policy whereby control requirements would be determined on a case-by-case basis.

Staff Organization for Control of Air Toxics

There are four distinguishing characteristics that emerged from review of the organizations responsible for the eight air toxics programs studied:

- the division of organizations by environmental media, (e.g., air, water)

- the degree of centralization of air toxics responsibilities within the central office of the administrative agency,

- the degree of centralization of the permitting function, and

- the disciplines represented on the staffs.

All eight organizations are divided by media, but many have systems for air permit review by staff groups responsible for media other than air in cases where toxic emissions have the potential to effect other media.

Michigan is an example of a centralized air toxics organization. Michigan has a unit within its Air Quality Division that serves as the central point for the air toxics program. New Jersey, on the other hand, has divided its air toxics work among several divisions within the Air Branch staff. New York's organization represents somewhat of a middle ground between these two examples. New York's organization has one section in the Division of Air whose duties center around the air toxics program and several other sections whose general duties include some air toxics functions, such as maintaining the emissions inventory or conducting special ambient monitoring studies.

The degree of centralization of the permitting function is an important characteristic because all the programs rely on permitting to accomplish air toxics control. Michigan, Kentucky, New Jersey, Texas, and Philadelphia have a centralized permitting group, and all permits are issued by this group. Permits in New York and California, on the other hand, are issued by regional offices. Both New York and California have supporting offices at the State levels to assist the regional offices.

The fourth important characteristic of the programs investigated is the variety of disciplines involved in the air toxics programs. All the programs are staffed with chemical engineers and most include chemists, toxicologists, and meteorologists. California's Air Resources Board staff includes a medical doctor and Kentucky's Natural Resources and Environmental Protection Cabinet staff includes an epidemiologist. Michigan emphasized the importance to its air toxics program of having the expertise of a chemist and a toxicologist. New York also emphasized the importance of having a toxicologist on the Division of Air staff and the added expertise available from the New York Department of Health.

OVERVIEW OF THE REGULATORY PROGRAMS

Function

All eight air toxics programs studied accomplish (or plan to accomplish in the cases of Philadelphia, California, and Illinois) air toxics control using permitting systems coordinated with their criteria pollutant permitting systems. The programs in Michigan, New York, Kentucky, and Texas include procedures or guidelines for determining acceptable ambient concentrations. Acceptable ambient concentrations are used to determine whether permits should be granted. A permit would be granted if the ambient concentration beyond the property line resulting from a source's emissions does not exceed the ambient concentration determined to be acceptable. Philadelphia plans to use a similar approach and Illinois also is considering this approach. California's proposed program is similar to these with two exceptions. First, for toxic air contaminants for which the State determines that no acceptable threshold can be set, the control objective would be to eliminate or minimize any public exposure. Second, unlike the somewhat flexible guidelines of the other programs, California may promulgate ambient air quality standards for some air toxics. Rather than basing permitting decisions on a source's contribution to the ambient concentration, New Jersey requires state-of-the-art controls and specific stack parameters before a permit can be granted to sources of the 11 toxic volatile organic substances regulated.

Scope

There are four factors which define the scope of the eight programs studied:

- designation of substances to be regulated as air toxics,

- designation of source types to be permitted according to air toxics policies,

- designation of minimum emissions cutoffs for applying air toxics policies, and

- applicability of permitting policies to new, modified, and existing sources.

Some programs limit the application of the air toxics policies to certain contaminants, while others consider all toxic contaminants. The substances covered by the air toxics programs in New Jersey and Philadelphia are specifically defined. New Jersey has a list of 11 toxic volatile organic substances and Philadelphia has a list of 99 substances it plans to control. Illinois is considering using a specific list of compounds to limit the scopes of their program. New York, Michigan, Texas, Kentucky, and California differ in scope from New Jersey and Illinois in that they characterize their air toxics policy as applying to sources that emit any toxic substances not specifically covered by existing Federal cr State standards.

The second factor that defines the scope of some programs is application of the air toxics policy only to specific types of sources. New York's program, for example, applies to emissions from process, exhaust and/or ventilation systems. Illinois is considering an approach that would control toxic emissions from six specific priority industries such as organic chemical manufacturing and plastics and synthetics manufacturing. New Jersey, Philadelphia, and Texas also exempt certain sources.

The third factor which defines the scope of the programs is the designation of minimum emissions cutoffs in applying the air toxics policy. New Jersey's program incorporates such minimum cutoffs. For example, New Jersey's regulation does not apply to any of the 11 regulated toxic volatile organic substances (TVOS) if the TVOS is less than 0.25 percent by weight of any raw material or finished product or if it is emitted at a rate less than 0.1 pounds (45.4 grams) per hour.

The fourth definitive factor for the scope of these programs is application of the air toxics policy only to new and modified sources or to existing sources as well through permit renewal.[a] New Jersey and New York both require permit renewal for sources of air toxics; Philadelphia, California, and Illinois plan or are considering use of their existing authority to require permit renewal. Illinois plans to require some sources to gather more data on potential health hazards and feasibility of reducing their toxic emissions during the period for which the permit is issued. This new data would then be considered with the permit renewal application. Michigan and Texas issue permits to new and modified sources only and do not review permits for existing facilities.

SUMMARY OF PERMITTING PROCESS

All eight programs are based on control of air toxics using existing criteria pollutant permitting processes. With the exception of New Jersey, all the programs follow or plan to follow similar decision making processes for issuing permits to sources of air toxics. There are four general considerations in this process:

- determination of a source's emissions and emission rates,
- determination of acceptable ambient concentrations,
- estimation of a source's contribution to the ambient concentration, and

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[a] Modification was commonly defined as a change which increases the amount of a pollutant emitted from the source or which results in the emission of a pollutant not previously emitted.

- comparison of an allowable ambient concentration to a source's contribution to the ambient concentration.

Data needed for the first consideration, substances emitted from a source and the emission rates, are typically supplied in permit applications. The second consideration in the permitting processes is the determination of acceptable ambient concentrations for particular toxic emissions. Six of the programs generally determine acceptable ambient concentrations by applying some factor to the threshold limit value (TLV).[b] Michigan, and in some cases, Kentucky and New York also use quantitative risk assessment to determine acceptable ambient concentrations for suspected carcinogens.

All seven of the programs using ambient levels in their decision making process use dispersion modeling to estimate a source's contribution to ambient concentrations. However, Michigan takes a slightly different approach from the other programs. Rather than using dispersion modeling to estimate a source's contribution to ambient concentrations as most of the programs do, Michigan uses dispersion modeling to calculate a maximum allowable stack limit for a source based on an acceptable ambient concentration and a source's stack parameters.

The fourth consideration in the permitting processes is a comparison of allowable ambient concentrations and a source's contribution to the ambient concentration. In Michigan's case, an allowable stack limit is calculated based on the acceptable ambient concentration and the source's stack parameters. This allowable stack limit is then compared to a source's emissions from the stack. The decision to grant or deny a permit would be based on this comparison.

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[b] The TLV is a time-weighted average concentration for an 8-hour workday, 5 days per week to which nearly all workers can be exposed, day after day, without adverse effect.

New Jersey's program is the only exception to this general four-part permitting process. New Jersey's program requires any source of the 11 toxic volatile organic substances covered under their program to list emission information in its registration form and to apply state-of-the-art controls to limit emissions of those 11 substances.

DETAILED DISCUSSION OF PERMITTING CONSIDERATIONS

Determination of Acceptable Ambient Concentrations

As mentioned in the previous section, all programs except New Jersey's develop acceptable ambient concentrations for each toxic air pollutant or review measured or predicted ambient concentrations for acceptability. California's proposed program did not describe a method for determining an acceptable concentration, but the other six programs apply safety and time factors to the American Conference of Governmental Industrial Hygienists (ACGIH) TLV's. Texas and Philadelphia may use Occupational Safety and Health Administration (OSHA) or National Institute of Occupational Safety and Health (NIOSH) TLV's if those TLV's are more recent or the staff feels they are more reliable. In all six cases, the acceptable ambient concentration refers to the maximum concentration at ground level under plume center at or beyond the property line. Table 2 summarizes the factors applied to TLV's by the states using this approach. Philadelphia is still in the process of determining the specific factor that will be applied to TLV's. Factors are applied to TLV's to account for individual variation in the general public such as the greater sensitivity of children and elderly people compared to the industrial worker and to account for continuous exposure rather than the 8-hour workday 5 days per week used to establish the TLV. Kentucky, for example, uses a time factor of 4.2 (168 hours per week/40 hour work week), and a safety factor of 10.

If there is no TLV for a particular substance, an acceptable ambient concentration is determined by other methods. Michigan, for instance, uses

TABLE 2. FACTORS APPLIED TO TLV'S AND AVERAGING PERIODS
USED BY FIVE STATE AGENCIES IN PERMITING SOURCES OF TOXIC EMISSIONS

Program	Factor	Averaging Period
Michigan	1/100 (1 percent)	any period[d]
New York[a]	1/300, 1/50 (0.3, 2 percent)	annual
Kentucky	1/42 (2.3 percent)	1 hour
Texas	1/100 (1 percent)[c]	30 minutes (acute effects) annual (carcinogens, mutagens)
Illinois[b] (carcinogens)	1/100, 1/300 (1, 0.3 percent)	annual 24 hour (noncarcinogens)

[a] New York uses the factor of 1/300 for substances it classifies highly or moderately toxic and 1/50 for substances in the low toxicity classification. The high toxicity classification includes substances such as demonstrated human carcinogens that pose a significant risk. The moderately toxic classification includes substances demonstrated to be animal carcinogens. The low toxicity classification includes substances which cause mild irritation.

[b] Illinois is considering an approach that requires remedial action if a source's contribution to ambient concentrations exceeds the TLV/100 and considers as insignificant any contribution to ambient concentrations of less than the TLV/300.

[c] If the concentration of the noncriteria pollutant in question is below this level, its source is not reviewed further. If the ambient concentration exceeds this level, the source receives a case-by-case review to determine whether the resulting concentration is acceptable.

[d] The emission limit in the permit may not be exceeded for any averaging period. Calculation of this limit is based on an 8-hour averaging period if the acceptable ambient concentration was based on a TLV and an annual averaging period if the acceptable concentration was based on Michigan's toxicity model.

a toxicity model with inhalation or oral toxicity data, while Kentucky uses the TLV of a similar, usually more toxic substance.

Generally, for the six programs using this approach, a source's contribution to ambient concentrations cannot exceed an acceptable ambient concentration. The averaging time used to compute a source's contribution is an important factor in the stringency of this requirement. The averaging times used by the states using this approach are summarized in Table 2.

Several of the programs have additional requirements for sources emitting suspected carcinogens. Some deviate from the use of TLV's to determine acceptable ambient levels when toxic emissions are suspected carcinogens. Likewise, some programs have special control requirements for emissions of substances suspected to be carcinogens. Michigan, and, to some extent, New York and Kentucky, use quantitative carcinogenic risk assessment to determine acceptable ambient levels for substances suspected of being carcinogens.

In order to determine whether a particular substance should be treated as a carcinogen, Michigan consults several published lists of carcinogens and evaluates the studies done in developing the lists to determine if the substance is a potential airborne carcinogen to humans. If so, the permit applicant is required to use the best available control technology (BACT).[c] After application of BACT, the Michigan Air Quality Division staff performs a risk assessment for the particular source and substance. The staff uses an acceptable lifetime carcinogenic risk of 1 in 1,000,000 to the most exposed individual. If there are not adequate data to develop a risk analysis, sources must meet stack limits of "no detectable" emissions based on a specified analytical technique.

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[c] BACT is determined by the permit applicant and approved by the Michigan staff.

New York has used carcinogenic risk assessment to determine acceptable ambient concentrations for highly toxic substances and for substances used in relatively large volumes in New York. Like Michigan, New York uses a lifetime carcinogenic risk of 1 in 1,000,000 to the most exposed individual as an acceptable guideline and requires BACT for sources of demonstrated or suspected human carcinogens.

Kentucky has used carcinogenic risk assessment to determine if emissions from a proposed synfuels plant would present a significant health hazard. Suspected carcinogens were identified by a panel of experts. Unlike New York and Michigan, Kentucky's analysis was based on the number of excess deaths that would be expected to occur in the exposed population over a lifetime. Analysis of the proposed synfuels plant emissions indicated that less than one cancer death would occur in the exposed population over a lifetime. Based on this analysis, the Air Division has tentatively recommended approval of the permit to the Secretary of Kentucky's Natural Resources and Environmental Protection Cabinet.

Emission Inventories

Most of the eight agencies administering the programs studied have established emissions inventory systems. Two types of inventories are represented among the eight programs:

- an inventory of emission and source data based on sources that have obtained permits and
- an inventory of specific emissions from existing sources, separate from permitting data.

Data for the first type of inventory are collected from permit applications. Programs using this type of inventory include criteria pollutants as well as air toxics in their inventory data. Kentucky uses this type of emission inventory. Their data are used to make future emission projections, record historical data, determine the emission reduction achieved and the cost of control. New York, New Jersey and Texas have similar inventories and

California plans to expand its existing criteria pollutant system to include air toxics.

New Jersey and Philadelphia have the second type of inventory with data on emissions of specific substances from existing sources. They both have collected inventory data by mailed questionnaires. Philadelphia's system solicited information on the 99 substances covered by its air toxics program. The information was collected in order to identify sources which might require toxics control. New Jersey's industrial surveys project solicits information from existing sources for 155 toxic substances. New Jersey wants to establish a data base on sources, uses, and control methods for these substances and to identify geographical areas and population groups subject to increased disease risk due to exposure to these substances.

Estimation of Source Emissions

With the exception of New Jersey's, the programs studied require estimates of the sources emissions and use (or plan to use) dispersion modeling to relate source emission rates to acceptable ambient concentrations. Most approaches use dispersion modeling based on stack parameters and emission data in the permit application to estimate a source's contribution to a maximum ambient concentration beyond the property line. Michigan, however, uses dispersion modeling to determine an allowable stack emission rate equivalent to an acceptable ambient concentration.

Michigan and New York have both considered the question of contributions from nearby sources to the ambient concentration in their dispersion modeling. In Michigan, sources emitting a substance considered to be carcinogenic must model multiple sources of that substance together if the source was permitted after mid-1981. Sources of substances not considered carcinogenic are required to model only the incremental emission contribution from the new source. New York requires that all sources of a particular toxic within a plant be modeled together and that all plants within 5 kilometers of each other be modeled together.

Several of the programs that use dispersion modeling use screening processes to estimate a source's emissions and to determine if detailed dispersion modeling is necessary. The screening process quickly identifies sources whose emissions of toxics would result in ambient concentrations well below acceptable ambient concentrations. Such sources would not warrant detailed dispersion modeling. Kentucky, for example, uses the computerized point max model and can complete the screening process in less than 1 hour per source. Michigan uses a table of dilution factors constructed from modeling data and worst case meteorological data. The dilution factors from this matrix can be used readily to calculate allowable stack emission rates based on acceptable ambient concentrations.

Permitting

Generally speaking, if toxic emissions from a source will not exceed an acceptable level, then a permit would be granted. In Philadelphia, if toxic emissions from the source result in an ambient concentration close to the ambient air quality guideline, either above or below, then further study is done to determine if the permit should be granted. Illinois is considering a somewhat similar approach that would grant permits to sources whose contributions to ambient concentrations are insignificant, require remedial action if a source's contribution is hazardous, and define a range of ambient concentrations where further analysis of a source would be required.

In New Jersey, sources must show that they will be using state-of-the-art controls and the control measures to be applied are specified in the permit. Other programs currently issuing permits to sources of toxics specify emission limits calculated from acceptable ambient concentrations and stack parameters, control measures that must be applied to achieve specified limits, and any stack testing or ambient monitoring requirements.

Ambient Monitoring

Two general types of ambient monitoring for air toxics are conducted in the eight programs studied:

- monitoring done to ensure that a source's contribution to ambient concentrations does not exceed an acceptable ambient level and

- monitoring done to collect background data on ambient concentrations of air toxics.

Michigan gave one example of a permit that required the first type of ambient monitoring where a plant which emitted a particular carcinogen was planning to concurrently remodel and add on to its existing facility, install control devices, and perform a cleanup operation.

New Jersey has one of the most extensive ambient monitoring programs for collecting background data. New Jersey monitors for over 30 toxic substances at four residential sites, on a 24-hour basis, 7 days per week, for six weeks in summer and winter. New York also has an ambient monitoring program for air toxics which includes monitoring for PCB's, lindane, seven phthalates, benzo[a]pyrene, and six heavy metals. Monitoring is being done at six sites in rural, residential/industrial, and urban areas to gather background data and to develop a long-term profile on toxic substances.

Texas monitors for 32 elements in particulate matter, several of which are toxic. This monitoring is done at approximately 100 sites within the State using x-ray fluorescence analysis.

ADMINISTRATIVE ISSUES

Outside Involvement

Involvement by people outside of the air agencies consisted of:

- consultation of organized panels of experts on specific issues,
- consultation and review from other agencies, and
- input from industry and the public during both the development and the administration of the air toxics programs.

Philadelphia, Kentucky, Texas, and California have all consulted ad hoc panels on various issues. The panels have been composed of experts in fields which help to supplement expertise on the agency staffs. Philadelphia, for instance, uses an ad hoc committee composed of representatives from industry, academia, government, and the community to assist in developing the ambient air quality guidelines. These committee members, experts in toxicology, industrial hygiene, and occupational medicine, provided the expert knowledge and judgement in the area of health effects necessary to the development of ambient air quality guidelines for toxic substances.

Routine consultation between the New York Division of Air and experts in the Department of Health is one example of involvement of agencies other than air. New York also consults members of the Division of Air's Council of Technical Resources, composed of representatives from industry, academia, and consulting firms.

Public and industry participation in the development and administration of air toxics policy was the second type of outside involvement. With the exception of New Jersey, all of the approaches studied were considered to be guidelines and none had undergone the formal public hearing process that would be required of the administering agencies prior to formal rulemaking. However, the public had not been excluded from the development and operation of these programs. Michigan, in fact, attributes a large measure of its success to the involvement of industry and the public during the development of their air toxics program. Michigan's program was developed by a Special Air Advisory Committee which included industry representatives and whose meetings were open to the public. Likewise, meetings held by California Air Resources Board on air toxics issues have been open to the public. New York solicited comments during the development of its program from representatives of industry, the legislature, environmental groups, academia, and consulting firms.

In addition to outside involvement during the development of a program, some programs provide an opportunity for involvement during the administration of the program. For example, Kentucky holds public hearings and solicits public comments before making a final decision on permits involving a major source (i.e., a source with the potential to emit 100 tons per year or more of any one pollutant) or a source that has generated a great deal of public interest. Michigan has similar provisions for public hearings. Another example of outside involvement is the workshop held by one of the regional offices in New York. The workshop was held to explain the air toxics control policy and permitting procedures to industry representatives in the region.

Operation to Date

Of the five programs currently permitting sources of air toxics (Michigan, New Jersey, New York, Kentucky, and Texas), the New York and Texas programs are the oldest, begun in 1966 and 1971, respectively. The other programs were started between 1978 and late 1981. The Texas program is the only one of the five that has undergone legal challenge. Both the permitting system in general and several individual permits have been challenged in Texas, but where the challenge has been to a fundamental part of the Air Control Board Regulations, the Board has been upheld by the Texas Supreme Court.

Level of Effort

The level of effort for both development and operation of the programs was estimated for several of the programs. Michigan's program was developed over a period of 30 months with 1½ to 2 work-years of staff time. New York's program was developed over a period of 18 months with about 5 work-years of staff time. For operation of the air toxics program, New Jersey and Kentucky both estimated a cost of approximately 10 percent of their air budgets. Most of the program staffs explained that permitting is done by groups that handle criteria pollutant permits as well and thus it is difficult to estimate time devoted solely to air toxics.

PART II

SECTION 4

AIR TOXIC CONTROL STRATEGIES: STATE OF MICHIGAN

BACKGROUND INFORMATION

Initiation of Air Toxic Control

The State of Michigan accelerated development of its program to regulate toxic air pollutants for two primary reasons. First, about five years ago, the proliferation of toxic substances in the State was brought into the public eye as a result of some incidents involving toxic chemicals. Examples of these incidents were the accidental addition of highly toxic polybrominated biphenyls (PBB) to cattle feed and the discovery of groundwater contamination caused by the deposition of chemical wastes at a plant site. The State responded to the public's concern over toxic chemicals in several ways including the initiation of air toxics control.

The second reason for beginning an air toxics control program was the need for a consistent, timely approach for processing permits for new facilities. A system was needed that would let permit applicants know, prior to submitting an application, what the State considered an acceptable emission limit for toxic air emissions.

Enabling Legislation

The enabling legislation for the regulation of toxic air pollutants in Michigan is the Air Pollution Act, as amended in 1977.(1) This Act defined air contaminant and air pollution, established the Air Pollution Control

Commission, gave the Commission the authority to develop rules for controlling air pollution, and established penalties for failure to comply with the Commission's rules. The Commission consists of eight citizens and directors of the departments of public health, natural resources, and agriculture. The eight citizen representatives, appointed by the governor, consist of two representatives of industrial management, two representatives of local government, one medical doctor, one member of organized labor, and two representatives of the general public.

Both the Air Pollution Act and the Air Pollution Control Commission use a broad definition of the term "air contaminant." They define it as ". . . a dust, fume, gas, mist, odor, smoke, vapor, or any combination thereof." Similarly, the Act and the Commission broadly define "air pollution" as

> ". . . the presence in the outdoor atmosphere of air contaminants in quantities, with characteristics, under conditions and circumstances, and a duration which are or can become injurious to human health or welfare, to animal life, to plant life, or to property, or which interfere with the enjoyment of life and property in this state [excluding all aspects of employee health and safety hazards and usual and ordinary animal odors associated with agriculture]."(1)

The broad definitions of "air contaminant" and "air pollutant" allow the State to regulate toxic air pollutants.

The Air Pollution Control Commission has promulgated several rules pertaining to air pollution control. The rules involved in the control of toxic air pollutants prohibit the emissions of air contaminants that interfere with the enjoyment of or cause injury to life or property. The rules require that

> "A person shall not install, construct, reconstruct, relocate, or alter any process, fuel-burning, or refuse-burning equipment, or control equipment pertaining thereto, which may be a source of an air

> contaminant, until a permit [to install] is issued by the commission."(1)

The Commission also requires these sources to obtain a permit to operate after the installation or construction, etc., is completed. In addition, applicants are required by the Commission to provide information in the application such as types of air contaminants, emission rates, effects on human health.

State Organization for Controlling Air Toxics

In the State government organization, the Air Quality Division within the Department of Natural Resources has the authority to review and approve permit applications required by the Air Pollution Control Commission. Within the Air Quality Division, the Air Emissions Assessment Unit, the Permit Unit, and district offices have responsibilities for control of air toxics. Figure 1 illustrates the organization of the Air Quality Division.

The Air Emissions Assessment Unit was established to respond to incidents of environmental damage and health concerns. This unit is the central point within the Air Quality Division for the control of air toxics. It has the responsibility for advising the Permit Unit on questions of toxicity and for interacting with other divisions and departments when toxic substances at a particular site must be controlled from air as well as other media. The unit conducts training within the Air Quality Division on control of air toxics, participates in cleanup operations where toxic air pollutants will be released during the cleanup operation, and undertakes special studies of chemical industries. The staff of the Air Emissions Assessment Unit consists of three engineers, a chemist, a toxicologist and a source sampling specialist.

The Permit Unit, composed of 14 engineers, processes permit applications and prepares the permits. The district engineers in the regional

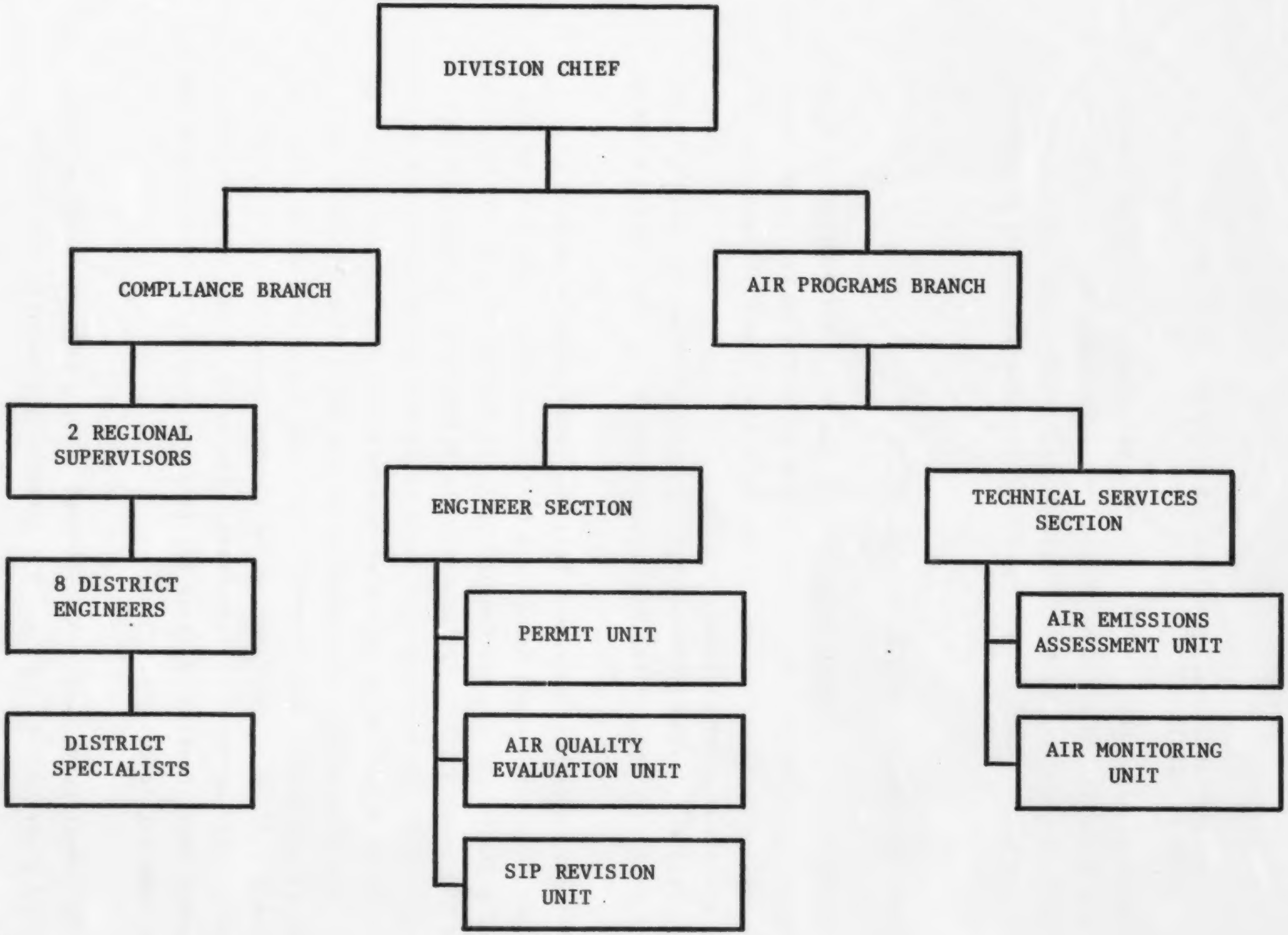
DIVISION CHIEF
COMPLIANCE BRANCH
AIR PROGRAMS BRANCH
2 REGIONAL SUPERVISORS
8 DISTRICT ENGINEERS
DISTRICT SPECIALISTS
ENGINEER SECTION
PERMIT UNIT
AIR QUALITY EVALUATION UNIT
SIP REVISION UNIT
TECHNICAL SERVICES SECTION
AIR EMISSIONS ASSESSMENT UNIT
AIR MONITORING UNIT

Figure 1. Michigan Air Quality Division organization.

offices investigate possible violations of air toxics permit conditions from sources in their districts.

The Office of Toxic Materials Control in the Department of Natural Resource's Environmental Services Division is also involved in the air toxics program. This office collects information on toxicity of various substances and assesses the toxicity and environmental effects of various air toxics in support of the Air Quality Division's regulatory program. The Office of Toxic Materials Control performs some risk assessments for the Air Quality Division.

The State of Michigan can delegate air pollution control authority to the local governments. To date only Wayne County (i.e., the greater Detroit area) has taken a role in controlling toxic air pollutants. Wayne County represents a large portion of the State's industrial base and has an air pollution control staff approximately the same size as the State's air staff. Integration of Wayne County and State air control activities is accomplished in part by county representation on the Air Pollution Control Commission. The Director of Wayne County Health Department's Air Pollution Control Division is a commission member. Wayne County has also begun control of air toxics and is currently applying the State's framework for processing permit applications for new sources involving toxic air pollutants.

OVERVIEW OF THE REGULATORY PROGRAM

Function

In May 1979, the Michigan Air Pollution Control Commission appointed the Special Air Advisory Committee to determine if a problem existed relative to air emissions of noncriteria pollutants and if it did, to propose a regulatory framework for control of such emissions. The Committee did not address the question of whether or not there is any association between human health problems and ambient air concentrations of noncriteria pollutants. Without deliberating on or passing judgement about the degree of public exposure to noncriteria pollutants, the Committee felt that it was prudent to establish some reasonable, uniform guidelines for issuing permits for air emissions of noncriteria pollutants in the State of Michigan.(2)

The final report of the Committee, "A Proposed Framework for Processing Air Quality Permit Applications for New Emission Sources of Non-Criteria Pollutants,"(2) was completed in November 1981. The framework provides guidance for the air quality permit decision-making process. In order to obtain a permit, an applicant must demonstrate the environmental acceptability of emissions of noncriteria pollutants. The Committee believes that pollutant concentrations derived using the framework in most instances will not be a hazard to public health. Without setting ambient air quality standards, the framework specifies a uniform set of objective criteria that an applicant may use to demonstrate the environmental acceptability of the proposed emissions.

Scope

The framework applies to permits for substances not covered under existing Federal or State regulations. Specifically, the framework does not apply to criteria pollutants (sulfur oxides, particulate matter, carbon monoxide, ozone, volatile organic compounds, nitrogen dioxide, and lead), sources covered by National Emission Standards for Hazardous Air Pollutants (i.e., sources of asbestos, beryllium, beryllium rocket motor firing, mercury, and vinyl chloride), or to sources for which emission standards have been established in State rules or Federal New Source Performance Standards. It covers new sources and does not provide an exemption for sources below a minimum cut-off level. Any source where the quantity or type of air emissions changes is a "modified" source and must follow the same permitting procedures as a new source.

Summary of Permitting Process(2-3)

For summary purposes application of the permitting process to toxic air pollutants can be explained in four general steps. First, on the permit application, the applicant must list the emission rate and content for each air contaminant stream with and without any control devices. The application must include criteria and noncriteria pollutants. The next step is to estimate the acceptable ambient concentration of the toxic pollutants. Estimates are made by the Permit Unit according to the framework when processing the application, but they may also be made by the applicant to determine the likelihood of receiving the permit. The acceptable ambient concentration for carcinogens is determined on the basis of either a "no detectable" level in the stack or a risk analysis when there is sufficient data. For substances not considered to be carcinogens, the acceptable ambient concentration at ground level under plume center at or beyond the property line is considered to be 1 percent of the American Conference of Governmental and Industrial Hygienists (ACGIH) threshold limit value (TLV). If there is no TLV for a certain substance, the toxicity model is used to determine the acceptable ambient concentration at or beyond the property line.

The third step is to calculate the allowable emission rate from the stack using the acceptable ambient concentration and to compare it to the estimate of the source's emission rate. The allowed emission rate from the stack is calculated by multiplying the acceptable ambient concentration by a dilution factor. The dilution factor takes into account building and stack height, volume flow rate, distance to the nearest property line, and meteorological conditions. It is used to calculate the stack concentration that would produce a given ambient concentration. The dilution factor is first estimated from a dilution factor matrix. The matrix gives a dilution factor based on generalized meteorological conditions and the stack parameters supplied in the application. Use of the dilution factor matrix is not a substitute for dispersion modeling, but indicates whether dispersion modeling should be required. If the source would exceed the stack limit based on the dilution factor matrix, dispersion modeling would be done to determine a more precise dilution factor. This more precise dilution factor would then be used to calculate the stack limit.

The fourth step is the approval or denial of the permit. If the estimate of emissions is below the allowable emission rate from the stack, the permit will be approved. If not, the permit will require control measures, or it may be denied. All permits specify stack emission limits calculated from the acceptable ambient concentrations and any required control measures. Many specify some monitoring requirements.

FRAMEWORK

The framework developed by the Special Air Advisory Committee describes steps 2 and 3 of the permitting process, namely the determination of the acceptable ambient (boundary line or beyond) concentration and the comparison of the source's stack emissions to the allowable stack limit which is calculated from the acceptable ambient concentration. These two steps and specifications listed in the permit will be described in more detail in the following sections.

Determination of the Acceptable Ambient Concentration

Carcinogens--

As mentioned in the previous section, the process for specifying an acceptable ambient concentration depends on whether a given substance is a known or suspected carcinogen. Compounds found to be mutagenic in at least two test systems may warrant further consideration as suspected carcinogens. Test systems include short-term tests such as the Ames test.

To determine if a particular substance is a carcinogen or mutagen, Air Quality Division staff members begin by consulting published lists of chemicals having evidence of carcinogeneity. Examples of two such lists consulted are those prepared by the EPA Carcinogen Assessment Group(5) and the Occupational Safety and Health Administration (OSHA) list of candidate chemicals for further carcinogenic review.(6) If a particular substance was placed on such a list as a result of appropriate epidemiological studies and/or animal tests, then the substance will be regulated as a carcinogen. A substance on these lists would not be regulated as a carcinogen unless exposure to the compound via inhalation is likely to increase the risk of cancer.

Sources emitting any chemical deemed carcinogenic or mutagenic by this type of careful case-by-case review are required to install the best available control technology (BACT) for that source. It is the responsibility of the permit applicant to demonstrate to the Permit Unit that a given technology is BACT. This technology is specified in the permit.

The stack limit at a source emitting a carcinogen or mutagen is set in one of two ways. In both cases the limit would be set after the application of BACT. Ideally, the stack limit is based on a risk assessment if there are enough data available. The Air Quality Division Staff does the risk analysis. Based on an Air Pollution Control Commission decision made in July 1981, the Air Quality Division staff is using an acceptable lifetime carcinogenic risk of 1 in 1,000,000 to the most exposed individual. This is the probability of one person contracting cancer in his or her lifetime assuming one million people were exposed continuously to the compound. The allowance of emissions providing a higher risk would be considered individually by the Commission with opportunity for public comment. The ambient concentration associated with the acceptable risk and dispersion modeling results are used to determine the allowable stack emission limit. The emission limit is specified in the permit.

The linear nonthreshold model has been adopted as the primary basis for risk extrapolation to low levels of dose-response relationships. The linear nonthreshold hypothesis states that any exposure to a carcinogen can increase the risk of cancer and the greater the exposure, the greater the risk. Risk assessments made with this model are conservative; the risk is not likely to be greater, but it could be smaller than the estimate.(7)

The linearized multi-stage model(8) requires data from animal bioassays conducted with appropriate controls, at known exposure levels, with sufficient survival to allow statistical analyses to be completed, and a statistically significant increase in tumor incidence. In this analysis, the Air Quality Division assumes that the maximum emission rate occurs continuously and that the estimated risk is for an individual who remains at the maximum ground level concentration continuously for 70 years, absorbing 100 percent of the inhaled compound.(7)

If there are not adequate data to develop a risk analysis, sources are required to meet stack emission limits of "no detectable" emissions of the carcinogen or mutagen. In cases where the "no detectable" level is applied, the permit specifies the analytical procedure to be used and specifies as the emission limit the lowest possible concentration detectable by that method.

Other Toxic Substances--

Trace Emissions--For toxic substances that are not known carcinogens or mutagens, the "trace emission concept" may be used. A trace emission is any emission which results in a ground level ambient concentration of less than or equal to 0.04 micrograms per cubic meter at or beyond the applicant's plant boundary line. The trace level of 0.04 micrograms per cubic meter was derived from the use of an oral LD_{50} of 5 mg/kg. The Registry of Toxic Effects and Chemical Substances 1978 data base revealed that out of 10,417 citations for oral LD_{50}, only 4.73 percent had oral LD_{50} values of 5 mg/kg or less. In other words, 95 percent of the substances are less toxic than 5 mg/kg. An oral LD_{50} of 5 mg/kg is equivalent to an ambient concentration of 0.04 g/m^3.(2) (This equivalency is based on certain assumptions for estimating ambient concentrations based on oral LD_{50}. These assumptions are discussed below in description of Michigan's toxicity model.) For these 95 percent, the Committee believes that 0.04 micrograms per cubic meter would provide an adequate margin of safety.

For pollutants whose emissions fall into the trace category, applicants are not required to submit the toxicological data that may be required if a source's emissions are above the trace level. The permit would be issued using the 0.04 micrograms per cubic meter ambient level to calculate the stack emission limit specified in the permit.

Threshold Limit Values--For substances not known to be carcinogens or mutagens and with emissions greater than the trace level, the acceptable ambient concentration at the boundary line is determined using TLV's where available or a toxicity model if there is no TLV. The TLV values used are developed by the American Conference of Governmental Industrial Hygienists (ACGIH). The Air Quality Staff noted that the ACGIH is an organization recognized throughout the world for its expertise in establishing acceptable exposure concentrations for humans in industrial settings. For the purpose of deriving acceptable ambient air concentrations, the State feels the TLV - Time Weighted Average (TLV-TWA) is the most relevant data base because it relates to human exposure. The TLV-TWA is defined by the ACGIH as "the time-weighted average concentration for a normal 8-hour work day or 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect."(2)

The Air Quality Division staff uses 1 percent of the TLV as the acceptable ambient concentration at the plant boundary line or beyond for substances that are not suspected carcinogens and that are emitted in greater than trace amounts. This adjustment to the TLV accounts for two factors. First, according to the Committee's report, although TLV's already include a safety factor, the Committee decided to incorporate an additional safety factor "to account for individual variation in the general public."(2)

Second, 1 percent of the TLV takes into account the difference between exposure to a higher concentration during an 8 hour work shift, reflected by the TLV, and exposure to a lower concentration on a full-time basis.

Many compounds which may be emitted in Michigan do not have ACGIH TLV's. The Committee pointed out, "for some of the compounds for which no TLV's exist, there is nevertheless a significant body of toxicological information which may be used to establish limits roughly equivalent to a TLV, albeit lacking the sanction and expert input of the ACGIH."(2)

Toxicity Model--When no TLV exists for a substance, the Michigan framework calls for the use of a toxicity model, employing the most reliable data base available. If the Air Quality Division does not have toxicity data for a certain compound in question, it must be provided by the applicant. The Committee's report lists methods for determining the acceptable ambient air concentration from inhalation and oral toxicity data. The report noted, however, that the major causes for decreased reliability of toxiciological data used for this purpose are related to inappropriate routes of exposure (e.g., oral rather than inhalation) or related to durations of exposure shorter than the normal lifetime of the test species.

If a "no observed adverse effect level" (NOAEL) is available from lifetime inhalation studies in animals, then the Air Quality Division staff would use this data to derive an acceptable ambient concentration following techniques established for the derivation of acceptable residues for pesticides and food additives. These techniques incorporate a 10-fold safety factor for species differences and an additional 10-fold safety factor for individual differences. Since almost no animal inhalation studies are run for 24 hours per day for a lifetime, the NOAEL concentration is time averaged. In this case, the Air Quality staff would define the acceptable ambient air concentration derived from chronic lifetime animal inhalation data as:

$$C = \frac{A}{100} \times \frac{T}{168 \text{ hours per week}} \qquad (1)$$

where C = acceptable ambient concentration, $\mu g/m^3$

A = lifetime NOAEL, $\mu g/m^3$

T = length of animal exposure, hours/week

The special Air Advisory Committee pointed out that shorter term inhalation data are more frequently available and that as the duration of exposure decreases, the uncertainty in predicting an appropriate acceptable ambient air concentration increases. Thus, the Air Quality staff applies an uncertainty factor when using shorter term test data. Uncertainty factors applied to various test durations are determined from toxicology literature.(9) For example, an acceptable ambient air concentration derived from a 90-day animal inhalation study could be estimated as:

$$C = \frac{0.2 \times A}{100} \times \frac{T}{168 \text{ hours per week}} \qquad (2)$$

where C = acceptable ambient concentration, $\mu g/m^3$

A = 90-day NOAEL, $\mu g/m^3$

T = length of animal exposure, hours/week

This equation includes the assumptions that: (1) the 95th percentile ratio of lifetime NOAEL studies to 90-day NOAEL studies is approximately 1/5 or 0.2(3) and (2) the oral 95th percentile ratio is applicable to inhalation studies.

For 7-day inhalation data, an acceptable ambient concentration could be estimated as:

$$C = 0.029 \times \frac{A}{100} \times \frac{T}{168 \text{ hours per week}} \qquad (3)$$

where C = acceptable ambient concentration, $\mu g/m^3$

A = 7-day NOAEL, $\mu g/m^3$

T = length of animal exposure, hours/week

For 7-day studies, the 95th percentile ratio is 1/35 or 0.029.(9)

An inhalation LC_{50} concentration based on a minimum of 4 hours of inhalation exposure may be used, but is less reliable than longer term studies.

The estimated acceptable ambient air concentration based on an LC_{50} of at least 4 hours would be:

$$C = 0.002 \times LC_{50}/100 \qquad (4)$$

where C = acceptable ambient concentration, $\mu g/m^3$.

This equation includes the same assumption that the 95th percentile ratio of a short-term inhalation LC_{50} to a no observed effect level of a lifetime feeding study is 0.002.

Oral toxicity data may also be used to establish an acceptable ambient concentration. The Committee pointed out that oral toxicity data are frequently available where there are no inhalation data because inhalation experiments are much more expensive to conduct. Thus, it is quite often necessary to use oral data to make estimates about acceptable ambient concentrations.

The appendix to the Committee's report explains how oral toxicity data can be used to determine an acceptable ambient concentration. However, the Committee also added that all methods of estimating absorbed doses from different routes of administration are subject to error and different toxicologic effects can occur when the same material is administered by different routes. Hence, they emphasize that competent toxicologic judgement, both on the part of the applicant and the permit reviewer, will be required in instances where oral data are utilized.

Estimation of Emissions from the Source

After the determination of the acceptable ambient concentration at ground level under plume center at or beyond the property line, the concentration of stack emissions from the new source must be estimated to determine whether the source would meet the allowable stack emission limit which is calculated based on the acceptable ambient level.

Dilution Factor Matrix--

To streamline the permitting process, the Air Quality Division staff uses a dilution factor matrix to calculate the allowed emission rate from the stack and to determine whether or not a particular source would require dispersion modeling. The stack emission limit is the product of the acceptable ambient concentration and the dilution factor from the matrix. If the source would not exceed the stack emission limit, the permit would be granted. If the source would exceed this stack emission limit, a more refined estimate of the dilution factor would be determined by dispersion modeling and then used to calculate the stack emission limit. Determination of the dilution factor from the matrix requires building height, stack height, volume flow rate, and distance to the nearest property line. According to the Permit Unit, an 8-hour average dilution factor should be used when the acceptable ambient concentration is based on a TLV and an average annual dilution factor should be used for "trace" or "toxicity model" values.(3)

The matrix values are based on modeling conducted at plume level by the Air Quality Division and assume worst case meteorological conditions. Plume level concentrations were used to determine dilution factor estimates because worst case meteorological conditions can be more easily defined for plume level concentrations than for ground level concentrations. Plume level concentrations also take into account impaction on any nearby terrain and provide continuity in matrix calculations.

The dilution factor matrix is expressed in annual values calculated from 8-hour worst case meteorological conditions. The staff pointed out that,

> "Because worst case meteorological conditions generally exist only for short periods of time, care must be taken in applying scaling factors to estimate concentrations or dilution factors obtained from the matrix for different averaging times. Shorter time periods correspond with more restrictive dispersion conditions. Thus, a worst case condition existing for one hour would be much less likely to persist for 8 hours. For this reason, the dilution factor matrix should not be used for averaging times less than 8 hours."(2)

The staff went on to note that the dilution factor matrix is to be used to determine which sources require dispersion modeling. As a rough estimate, a scaling factor of 1/18 can be used to convert an annual dilution factor into an 8-hour dilution factor. They explained that this scaling factor is representative of average dispersion (not necessarily conservative) and has limited applications for multiple source modeling.

Appendix A contains the dilution factor matrix and instructions for determining a dilution factor.

Dispersion Modeling--

For sources where estimated emission concentrations exceed stack emission limits determined by the dilution factor matrix and the acceptable ambient concentration, dispersion modeling is used to determine a more refined estimate of the dilution factor. Modeling is generally done by the applicant for major source applications. However, it is recommended that the applicant contact the Air Quality Division to determine which models and procedures are appropriate. The Air Quality staff uses annual averaging to determine the in-stack concentration necessary to achieve the acceptable ambient concentration for trace and toxicity model limits. Similarly, the Air Quality staff uses an 8-hour averaging time to determine the in-stack concentration necessary to meet the 1 percent TLV ambient concentration limit.

For toxic substances that are not considered to be carcinogens, permit applicants are only required to model incremental emission contributions from the new source. However, when permit applications involve emissions of a carcinogen, all sources of the carcinogen in the area that have received permits since mid-1981, must be modeled together for determining the ambient concentration and for doing risk analysis.

In developing the method for determining the acceptable ambient concentration and comparing it to the expected concentration from the new source, the Special Air Advisory Committee acknowledged that not all sources would emit toxic air pollutants continuously. Indeed, they noted that a significant number of companies operate on an intermittent schedule. Consideration was given to allowing higher boundary line acceptable ambient concentrations at intermittent sources. This plan was not implemented, however, due to the potential enforcement problems.

Permitting

The granting of operating permits for new sources is the means Michigan uses to enforce requirements limiting toxic air pollutants. Each stack is considered a source and therefore one plant can have many sources. It is the responsibility of the permit applicant to demonstrate environmental acceptability and the Division of Air Quality considers the framework for permitting one method of doing this.

The criterion used by the Air Quality Division staff in determining permit approval is attainment of the acceptable boundary line ambient concentration. The emission limit from the stack is calculated based on the acceptable ambient concentration and is specified in the permit. The stack emission limit is the maximum allowable concentration, and the source may not exceed this limit. Calculation of the allowable stack emission limit is based on an 8-hour averaging period if the acceptable ambient concentration was based on a TLV and an annual averaging period of the acceptable concentration was based on a toxicity model. Emissions in excess of the stack emission limit constitute a violation of permit requirements for which the source could be fined. To date, however, the State has detected no violations.

Also specified in the permit are any control measures required. For carcinogens and mutagens, best available control technology (BACT) is required. The permit applicant must prove that the control technique proposed is BACT. Some type of control may be required for other toxic air pollutants. Practically speaking, most sources that have been required to lower ambient concentrations of substances not considered carcinogenic have done so by increasing stack height. The acceptable stack height can be determined from the dilution factor matrix or dispersion modeling. The required stack height is specified in the permit if an increase in stack height is the method chosen to reduce the ambient concentration. Other measures for meeting the acceptable boundary line concentration are installation of control devices.

In addition to the stack emission limit and any required control devices, permits may include requirements for scheduled source testing and ambient monitoring. In many permits the source would be required to perform an initial stack emissions test after operation begins, to demonstrate compliance with the stack emission limit required in the permit. Subsequent stack tests may be required with decreasing frequency to assure that emissions are below the specified limit. All test results would be reported to the State. In one instance a permit has required ambient monitoring at the property line. In this case, the company was remodeling and adding on to its existing facility, installing control devices, and performing a cleanup operation. Ambient monitoring of a particular carcinogen was required in the permit to determine the current ambient concentration and the concentration during and after the cleanup operation. From all sources on this particular site, the ambient concentration cannot create a lifetime cancer risk to the most exposed individual greater than 0.5 in 1,000,000 at or beyond the property line. In determining the acceptable lifetime carcinogenic risk, emissions from all plants in the area constructed after mid-1981 and emitting a particular pollutant are modeled cumulatively. In this case, there was another plant nearby emitting the substance in question and thus, the acceptable lifetime carcinogenic risk of 1 in 1,000,000 applied to both plants, making the acceptable risk 0.5 in 1,000,000 for each plant.

Permit applicants have the right to appeal to the Air Pollution Commission any denials or conditional approvals recommended by the Air Quality Division staff. In these cases the Commission and the applicant often negotiate an acceptable arrangement. In some cases of great public concern, public meetings are held to convey information and then a public hearing is held before the Commission.

Figure 2 illustrates the flow of activities and decisions made in the permitting process.

Ambient Monitoring and Emission Inventories

The Michigan Air Quality Division has no immediate plans for a broad based ambient monitoring program. The State has done some site specific ambient monitoring, but this has been related to specific problems. Most of this monitoring has been in connection with cleanup operations.

The Division has plans to begin an emission inventory for air toxics, although no work is currently being done in this area.

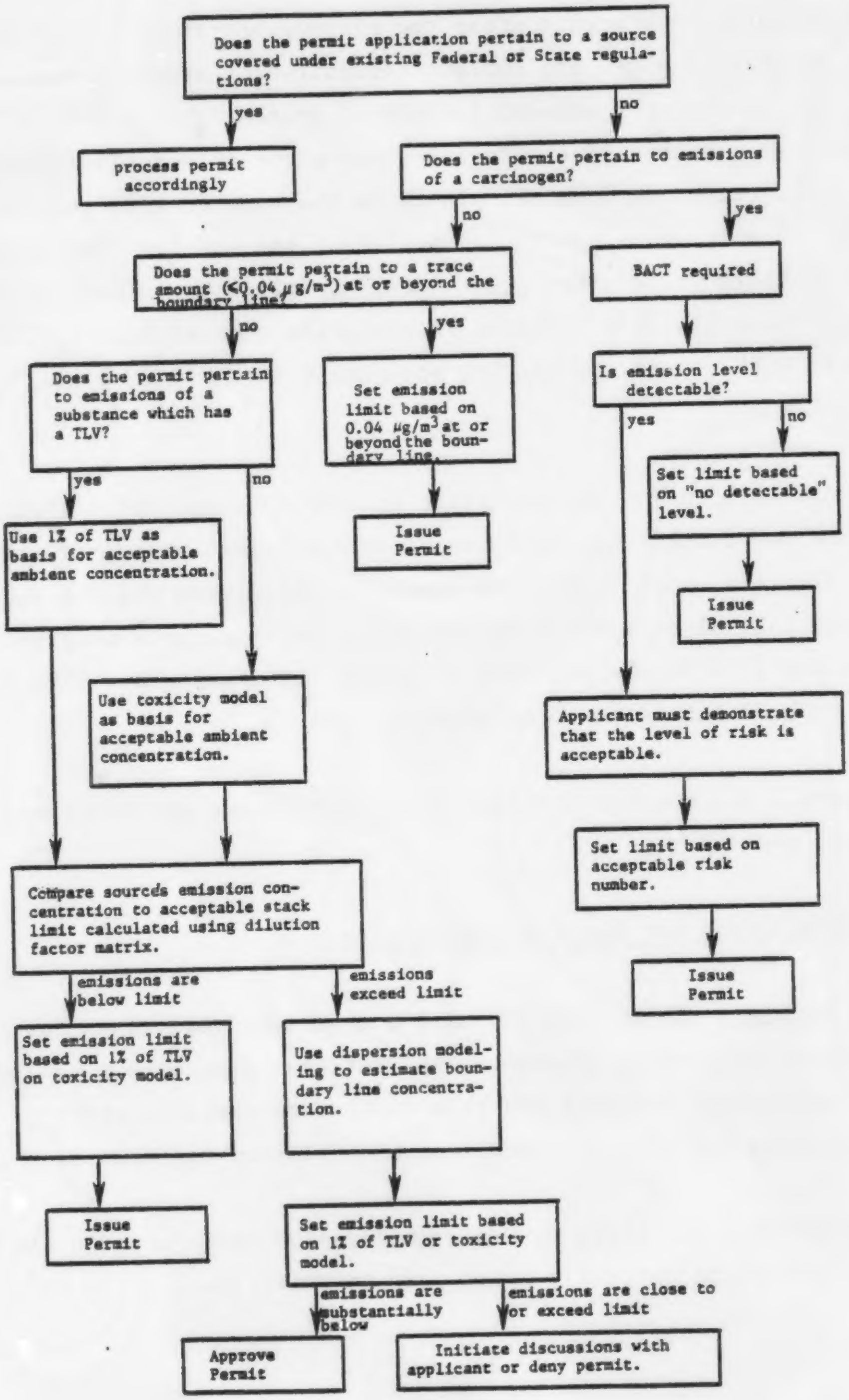
Does the permit application pertain to a source covered under existing Federal or State regulations?
yes
no
process permit accordingly
Does the permit pertain to emissions of a carcinogen?
no
yes
Does the permit pertain to a trace amount (<0.04 µg/m³) at or beyond the boundary line?
BACT required
no
yes
Does the permit pertain to emissions of a substance which has a TLV?
Set emission limit based on 0.04 µg/m³ at or beyond the boundary line.
Is emission level detectable?
yes
no
yes
no
Use 1% of TLV as basis for acceptable ambient concentration.
Issue Permit
Set limit based on "no detectable" level.
Issue Permit
Use toxicity model as basis for acceptable ambient concentration.
Applicant must demonstrate that the level of risk is acceptable.
Set limit based on acceptable risk number.
Compare sources emission concentration to acceptable stack limit calculated using dilution factor matrix.
Issue Permit
emissions are below limit
emissions exceed limit
Set emission limit based on 1% of TLV on toxicity model.
Use dispersion modeling to estimate boundary line concentration.
Issue Permit
Set emission limit based on 1% of TLV or toxicity model.
emissions are substantially below
emissions are close to or exceed limit
Approve Permit
Initiate discussions with applicant or deny permit.

Figure 2. Michigan air toxic permit review process

ADMINISTRATIVE ISSUES

Several other points about the Michigan program warrant discussion and can be grouped together under the general theme of Administrative Issues.

Panel of Experts

The recommendations of the Special Air Advisory Committee included provisions for forming a panel of experts to advise the Commission in special cases. Although the panel of experts concept has not been implemented, the Committee described three possible types of involvement for such a panel. First, the panel would advise the Commission if the applicant and the Air Quality staff could not reach an agreement in cases involving carcinogens or mutagens. The panel would also be consulted on special problems involving substances that are not suspected carcinogens, such as selection of the proper data bases when there is a large body of conflicting data. Situations where application of a general formula appears either too strict or too lax would be the third class of cases where the panel could make an informed judgement about the risks involved.

The Committee suggested that the panel consist of seven members chosen for their professional expertise in one of these disciplines: toxicology, genetic toxicology, chemistry, chemical engineering, industrial hygiene, medicine, meteorology, or biostatistics. To ensure impartiality, the Committee recommended that three or four panel members should be chosen from industry and three or four from academia. Panel decisions would be made by majority vote and would be final unless otherwise overruled by the Commission.

Operation of Framework to Date

This framework for handling permits involving toxic air pollutants has not been formally adopted by the Air Pollution Control Commission in the form of promulgated rules. The Air Quality Division staff considers it an acceptable method of demonstrating environmental acceptability; although, permit applicants are not required to use it. Applicants may devise another method of proving environmental acceptability, but to date, all permit applicants have used this system. After an applicant has demonstrated environmental acceptability and been granted a permit, the State has legal authority to enforce requirements specified in the permit.

Approximately 1500 permit applications involving air toxics have been evaluated using the framework. About 10 percent of these applicants have been required to use some control method. The framework has not undergone any legal challenges, but one contested case was settled by consent decree when the company involved agreed to follow the State's framework.

State Implementation Plan Requirements

Sources emitting toxic volatile organic compounds (VOC) or particulate matter may be subject to regulations of the State implementation plan (SIP) as well as the air toxics framework. The SIP regulations for VOC and particulate matter were not written to regulate toxic emissions. To date, sources of toxic VOC have been regulated using the framework and sources of toxic particulate matter have been regulated by either the SIP requirements or the framework, whichever is more stringent. There have been no legal challenges to this method and all applicants thus far have been able to meet the required limits.

Level of Effort Required for Air Toxic Regulation

The framework was developed over a period of 30 months. During this period about 1½ to 2 work-years of time were required on the part of the Air Quality Division staff. Currently involved in administration of the air toxic programs are three engineers, one chemist, one toxicologist and a source sampling specialist in the Air Emissions Assessment Unit and 14 engineers in the Permit Unit. These staff members devote about 75 percent of their time to the air toxics control.

Michigan's Evaluation of the Air Toxics Program

Members of the Air Quality Division staff cited four principal strengths of their program for regulating toxic air pollutants. First, it is a comprehensive approach that can be applied to any toxic air pollutant. They noted that they are not limited by a list of specific compounds. Second, the staff pointed out that permit applicants can readily apply the framework and determine whether their proposed emissions can meet the acceptable ambient concentration. This clearcut definition helps industrial sources in planning for future production. Third, this system is consistent with regard to a given substance. In other words, for a particular compound, each source would have to achieve the same acceptable boundary line ambient concentration. Finally, it is a well-defined procedure which enables the Air Quality staff to process permits quickly.

As for possible weaknesses, the staff pointed out that when using minimal data such as the inhalation LC_{50} or the oral LD_{50}, the proposed framework in some instances could be overly strict and, less frequently, might not be as strict as desireable. The staff also noted that once granted, permits are good for a lifetime and there is no review schedule. There are two exceptions to this lifetime permit. Modified sources (i.e., sources that have changed emission levels) must apply for new source permits. If the staff later determines that a substance posed a greater risk than realized when the permit was granted, they could seek an amendment to the permit through the Commission.

The Special Air Advisory Committee acknowledges, in agreement with the ACGIH, a number of difficulties associated with the use of TLV's for determining ambient concentrations of air pollutants. In their final report, the Committee noted,

> "TLV's are established only for a segment of the human population which does not include the full spectrum of individual variation and susceptibility which may

> actually occur. For example, the TLV's do not include consideration of the very young or the aged, or pre-existing conditions or diseases which might aggravate the response to any given material. Moreover, the basis on which TLV's are established varies from substance to substance, and the amount and nature of the available data base supporting the TLV's is different for each substance. Protection against impairment of health may be the guiding factor for setting some TLV's, whereas reasonable freedom from nuisances may be the factor for others. Consequently, the ACGIH cautions against uses of TLV's for evaluation and control of air pollution nuisances."(2)

The Committee's report went on to say,

> "Despite the limitations and problems associated with the use of TLV's, the Committee nevertheless believes that the TLV list is the best available single source of guidance with regard to inhaled materials. The TLV's represent the carefully reasoned opinion of a group of experienced, objective professionals in the fields of industrial hygiene and toxicology, and they are based on the best available information from industrial experience and from experimental human and animal studies. In addition, the TLV's are reviewed on a regular basis and, through use, represent a body of human experience. Of lesser, but nonetheless practical importance, is the fact that many other states also base their air quality approach on the TLV's in some manner."(2)

Lessons Learned Through Application

The Air Quality staff stressed two important points they felt were key to the success of their air toxics program. First was the high level of public and industry participation throughout the development of the framework. In addition to the fact that industry representatives were on the Special Air Advisory Committee, all Committee meetings were open to the public. Invitations were sent to many groups and individuals for each meeting. The Air Quality Division staff attributed a large measure of the framework's success to such public participation.

The second key factor cited by the Air Quality Staff is the multidisciplinary staff in the Air Quality Division and the laboratory facilities available. They recommended that other state staffs include chemists and toxicologists in order to review the data submitted by industry.

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APPENDIX A

DILUTION FACTOR MATRIX

INSTRUCTIONS

1. Do not use this matrix if HS is less than HB. If HS 2.5 x HB, set HB = HS/2.5.

2. Find the column for the appropriate building height, HB.

3. Determine distance to nearest property line.

4. If a range of values is given for dfo, perform linear interpolation according to stack height, HS.

5. Determine final annual dilution factor from the equation of

$$df = \frac{dfo}{10 \times VFR}, \quad VFR: \text{Volume Flow Rate in } M^3/S \; (1\ M^3/S = 2119\ CFM)$$

6. If using an 8-hour averaging time, divide df (from step 5) by 18.

7. If using a 24-hour averaging time, divide df (from step 5) by 10.

SUMMARY

Use of the dilution factor matrix requires building height, stack height, volume flow rate, and distance to nearest property line. The lower left portion of the matrix gives dilution factor ranges corresponding to ranges in stack height. The matrix values are based on modeling conducted at plume level with the Michigan Short Term (MIST) and Downwash models, which are used for permit evaluation by the Michigan Air Quality Division. The upper right portion of the matrix is based on modeling with MIST alone. In this portion of the matrix, the MIST model gives more conservative estimates for in-plume dilution factors.

The dilution factor matrix is based on 8-hour worst case meteorological conditions (2.5 meter/second wind, slightly unstable atmosphere) and is expressed in terms of annual values for dilution factors.

The use of the matrix is not a substitute for atmospheric dispersion modeling. Rather, it will be used to determine whether dispersion modeling is required. Final dispersion modeling estimates will consider plume-to-ground level dilution in addition to individual considerations.

DILUTION FACTOR MATRIX

Values for dfo (initial dilution factor) on an annual basis

HS / HB Distance	10'-25' / 10'	20'-50' / 20'	30'-75' / 30'	40'-100' / 40'	50'-125' / 50'	60'-150' / 60'	70'-175' / 70'	80'-200' / 80'	90'-225' / 90'	100'-250' / 100'
20' 30' 40'	469 2319 5082	539 2664 5837	585 2888 6330	619 3059 6705	648 3199 7011	672 3318 7272	693 3422 7499	711 3514 7702	728 3598 7886	744 3674 8054
60'	9524-13254	15225	16511	17489	18287	18966	19560	20089	20568	21005
80'	13453-24810	28033-28498	30906	32735	34229	35500	36612	37603	38499	39319
100'	18072-39683	34888-45579	49432	52355	54745	56777	58555	60144	61574	62885
150'	55350-90744	57919-104254	86207-113058	119760	125219	129872	133938	137564	140845	143843
200'	88236-160094	89824-185071	121462-200682	174737-212570	212769-222272	230521	237742	244180	250000	255321
250'	130435-240770	184043-287356	163937-311575	209788-330033	267862-345105	332226-357906	369112	379102	388149	396406
300'	176470-323206	245905-410116	211271-444820	263156-471180	330754-492667	396306-510964	470952-526963	541225	554119	565931
500'	440642-667334	563209-1064936	689174-1198605	811884-1270562	629314-1328551	734254-1377948	845552-1421087	963035-1459442	1087646-1494284	1219121-1526104
1000'	1530940-2009644	1872145-2903235	2164205-3913180	2443474-4633777	2719387-5002584	2996105-5217663	3275574-5384353	3557917-5529852	3845365-5661873	2891566-5782464
2000'	5396266-7035647	6404099-8678045	7187178-10459157	7887679-12533946	8547008-14771049	9185548-16909983	9812901-18690424	10432968-20013342	11053795-20945333	11675423-21607606

SECTION 5

AIR TOXICS CONTROL STRATEGIES: STATE OF NEW JERSEY

INTRODUCTION

New Jersey's air toxics program encompasses activities in two different areas - regulatory and research. The regulatory program is coordinated by the Department of Environmental Protection's (DEP) Air Branch. Research activities are coordinated by DEP's Office of Cancer and Toxic Substances Research (OCTSR). New Jersey's Department of Health is also conducting research, separate from that of DEP, on the air and water emissions from hazardous waste sites and some industrial facilities.

The first section of this report on New Jersey's air toxics program pertains to DEP's regulatory program while the second section pertains to its research activities. Each section includes a discussion of the initiation of the program, enabling legislation, program summary, and a detailed explanation of various program components. The final section of the report discusses administrative issues for both parts of the program.

REGULATORY PROGRAM

Initiation of Program and Enabling Legislation

In 1976, the governor of New Jersey issued a directive mandating a program to reduce the exposure of New Jersey citizens and the environment to carcinogenic and toxic substances. The driving force behind this mandate was public concern about the high cancer mortality rate in

New Jersey. A 1974 NCI report,[1] which covered the years 1950-1969, revealed that New Jersey had the highest incidence of cancer mortality in the U. S.

In response to the NCI report, the Air Branch of the New Jersey Department of Environmental Protection assumed the responsibility for developing an air toxics program for the State. The Department of Environmental Protection (DEP) first tried to initiate an air toxics program by amending its existing regulations for volatile organic compounds (VOC), a criteria pollutant, to include more stringent regulations for toxic volatile organic substances (TVOS). DEP developed a list of 11 substances to be regulated as TVOS. A proposed amendment to Subchapter 16 (N.J. Administrative Code -Title 7, Chapter 27, Subchapter 16) would have required sources emitting TVOS to achieve emissions reductions of 90 to 95 percent compared to an 85 percent reduction requirement for VOC. The proposed amendment to Subchapter 16 was not passed, however. The proposed "blanket" requirements of the amendment were not well received by industry in public hearings. Industry was adamant that a case-by-case approach be used for the control of toxics.

Consequently, DEP altered the requirements of the proposed TVOS regulation and separated it from the existing regulation for VOC. In December 1979, the regulation for TVOS was adopted as an amendment to Subchapter 17, "Control and Prohibition of Air Pollution by Toxic Substances." Prior to amendment, Subchapter 17 had pertained only to the use of asbestos in surface coatings, stating that:

> "no person shall cause, suffer, allow or permit surface coating by spraying on any building, structure, facility, installation or internal or external portion thereof, asbestos or friable material containing in excess of 0.25% by weight of asbestos."[2]

Under Subchapter 17, DEP has the authority to require testing to determine the amount of asbestos contained in surface coatings.

The remainder of this report deals only with that part of Subchapter 17 pertaining to TVOS. Because New Jersey's air toxics regulatory program was developed as an offshoot of its existing VOC regulation, no inorganic compounds except asbestos are included on its list of toxic substances. Subchapter 17 defines 11 TVOS to be regulated by DEP; it mandates state- of-the-art control for all sources, new and existing, emitting these TVOS; and it specifies minimum stack parameters required for sources emitting TVOS.

However, the authority to grant or deny operating permits to sources emitting TVOS is given by Subchapter 8, "Permits and Certificates". Subchapter 8 has been in effect since January 15, 1968 with several amendments adopted since that time. Subchapter 8 requires all new or modified sources to obtain permits to construct. Existing sources of TVOS are subject to Subchapter 8 due to the requirements of Subchapter 17 which state that all new and existing sources of TVOS must install state-of-the-art control. The installation of state-of-the-art controls to an existing facility constitutes a modification which, consequently, makes the source of TVOS subject to Subchapter 8.

Overview of Regulatory Program

The objective of DEP's air toxics program is to determine and implement state-of-the-art controls for emissions of specific organic materials that are designated as TVOS. Subchapter 17 applies to both new and existing sources which emit one or more of the 11 TVOS listed in Table 3. However, the regulation does not apply to any TVOS which:

1. Was not added to or deliberately formed in a raw material or a finished product; and

2. Does not exceed 0.25 percent by weight of any raw material or finished product; and
3. Is not emitted from any source operation, storage tank, or transfer operation at a rate in excess of 0.1 pounds (45.4 grams) per hour.[2]

Also exempt from the regulation is the benzene constituent of gasoline which is transferred to the atmosphere from storage tanks or transfer operations.

New Jersey's approach to the control of air toxics is very straightforward. Subchapter 17 requires any source emitting TVOS to submit a registration form listing the source type, quantity of emissions, and existing control method. DEP then evaluates the registration form to determine (based on its best judgement) whether existing controls represent state-of-the-art techniques. DEP also determines whether the source is in compliance with the stack parameters defined in Subchapter 17. If not, the facility is given 90 days to submit a compliance schedule with plans for implementing state-of-the-art controls. When DEP is satisfied that state-of-the-art controls are in place, or will be implemented as required, it grants the facility permission to continue operation. If controls are not in place, a detailed compliance plan is required to be submitted and completed.

TABLE 3. NEW JERSEY'S LIST OF TOXIC VOLATILE ORGANIC SUBSTANCES (TVOS)

Benzene (Benzol)
Carbon tetrachloride (Tetrachloromethane)
Chloroform (Trichloromethane)
Dioxane (1,4-Diethylene dioxide)
Ethylenimine (Aziridine)
Ethylene dibromide (1,2-Dibromoethane)
Ethylene dichloride (1,2-Dichloroethane)
1,1,2,2-Tetrachloroethane (sym-Tetrachloroethane)
Tetrachloroethylene (Perchloroethylene)
1,1,2-Trichloroethane (Vinyl trichloride)
Trichloroethylene (Trichloroethene)

Detailed Explanation of Components of Regulatory Program

Selection of 11 TVOS--

New Jersey's list of TVOS was developed in-house by DEP. Three criteria were used in selecting the 11 TVOS listed in Subchapter 17, and the substances had to meet all three criteria in order to be listed. The organic substances selected had to be relatively volatile so that there was potential for atmospheric release and exposure. Under New Jersey regulations, an organic substance is volatile if it has a vapor pressure or partial pressure of 0.02 psia or more at standard conditions. Moreover, either the International Agency for Research on Cancer (IARC)[3] or the National Cancer Institute (NCI)[4] must have concluded that these substances were carcinogenic to man or experimental animals. Carcinogens identified by animal testing were included only if positive results were obtained in two species, or if positive results had been duplicated in one specie.[a] The third criterion for selection was industrial usage in the United States. The production level of the selected substances exceeded 200,000 kg/year in the U.S. at the time of selection. DEP used U.S. production as a criterion rather than New Jersey production because, when the substances were selected in 1978-1979, little production data existed for chemicals produced in New Jersey.

Permitting--

Under Subchapter 17, any existing source emitting one or more of the 11 listed TVOS was required to register within six months of the effective date of the regulation (December 1979). A permit, under Subchapter 8, is required to construct or install any new equipment or to modify any existing equipment. Furthermore, state-of-the-art con- trol, as determined by DEP, is required before any permit is granted. DEP considers "state-of-the-art" synonomous with Best Available Control Technology (BACT). DEP evaluates existing and proposed New Source Performance Standards (NSPS) set by U.S. EPA and Best Available Control Technology (BACT) determinations made by EPA as bases for determining its state-of-the-art controls. In determining what constitutes state- of-the-art control, DEP may also examine controls typically used on similar source types or different source types with similar emissions characteristics. DEP stated that BACT determinations must be made on a case-by-case basis for existing sources. Determination of BACT on a case-by-case basis could lead to inconsistencies among similar sources, but DEP views the case-by-case analysis as the fairest approach. For example, in some cases it would be unreasonable to require an existing facility to implement the same controls as a new facility due to size, space, and structural limitations. The case-by-case approach allows consideration of such constraints.

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[a] Note: For several of the compounds shown in Table 1, positive results in one specie in an NCI bioassay were regarded as conclusive because multiple experimental groups were used for the specie tested.

New Jersey requires Reasonably Available Control Technology (RACT) RACT for all existing sources emitting VOC or other criteria pollutants and BACT for all new sources of criteria pollutant emissions. As stated above, all new and existing sources emitting TVOS are required to use BACT. Thus, New Jersey's control requirements for TVOS differ from those for VOC and criteria pollutants only for existing sources. In cases where a single source emits both TVOS and VOC the most stringent control requirements apply. However, DEP can consider BACT to be identical to RACT. In such cases the actual control requirements for existing sources of TVOS and VOC and other criteria pollutants may be the same.

In addition to state-of-the-art control, any facility emitting TVOS must comply with the following stack height, velocity, and discharge requirements in order to prevent aerodynamic downwash.

(a) No person shall cause, suffer, allow or permit any TVOS to be emitted from any source operation into the outdoor atmosphere unless such discharge is:

1. No less than 40 feet (12.2 meters) above grade; and
2. No less than 20 feet (6.1 meters) higher than any area of human use of occupancy within 50 feet (15.2 meters); and

3. Directed vertically upward at a discharge velocity of 3,600 feet per minute (1,097 meters per minute) or greater.

(b) No person shall cause, suffer, allow or permit the emission of a TVOS into the outdoor atmosphere from a system, equipment, or control apparatus not approved by the Department as being effective in preventing aerodynamic downwash.[2]

Under Subchapter 17, DEP also has the authority to require any facility emitting TVOS to conduct stack testing whenever DEP feels that such measures are necessary. DEP stated that testing is normally required to verify control equipment performance claims unless the control equipment used is fairly standard and its performance well documented. DEP also stated that most sources emitting TVOS will be tested. Stack testing is performed by the affected industrial facility according to methods prescribed by DEP.

As stated previously, all facilities emitting TVOS are required to report these emissions, source type, and existing control methods to DEP in their registrations. If DEP does not consider the existing controls to be state-of-the-art, the facility is given 90 days to submit a compliance schedule with plans for implementing the required controls. The facility is temporarily granted permission to operate during this period. When the facility has demonstrated state-of-the-art control, it is given an operating certificate which must be renewed every 5 years. If any routine emission rate changes are proposed during that 5-year period, the facility must notify the DEP prior to making the change.

RESEARCH ACTIVITIES

New Jersey's DEP is involved in several research activities not directly related to the provisions of Subchapter 17 but which could potentially impact the air toxics program. These activities include a program to conduct industrial usage surveys, a monitoring program, and maintenance of a resource center. These activities are all coordinated by DEP's Office of Cancer and Toxic Substances Research (OCTSR). DEP hopes to use the results of its industrial surveys project and its monitoring program to make programmatic and policy decisions concerning its air toxics program and the chemical substances regulated under this program.

The New Jersey Department of Health is also involved in research activities. The Department of Health's activities include monitoring hazardous waste sites and conducting health and mortality studies.

Industrial Surveys Program

DEP's industrial surveys project is an on-going program which was initiated in 1978. The authority to conduct these surveys and to require mandatory response was given under New Jersey Administrative Code - Title 7, Chapter 1F. This regulation states that the general objectives of this multimedia survey project are:

1. To establish a data base concerning the manufacture, use, storage, processing, formation, release, disposal and repackaging in New Jersey of a group of chemical substances selected on the basis of their carcinogenicity or toxicity, especially those produced or used in large quantities in the state;
2. To identify the areas of the state and population groups that are subject to an increased disease risk due to exposure to cancer-causing substances and other toxic agents in the environment; and
3. To establish a data base for the study of methods of reducing or eliminating the release of carcinogens and other toxic substances into the environment.

DEP conducts these extensive surveys by questionnaires which solicit the following information: plant location, number of employees, general use of selected substances; operations at the plant involving selected substances, the raw materials used and the products manufactured; selected substances released into the atmosphere and the quantities released; selected substances entering solid waste disposal streams, disposal methods and sites, waste disposal technology employed, and previous disposal practices; selected substances in the liquid waste streams, treatment prior to discharge, and discharge points; and information on points of release of selected substances.[5] If necessary, the respondent can request confidential treatment of the information provided.

DEP is conducting these surveys for 155 toxics listed in Table 4. These substances were selected based on toxicity determinations of the National Cancer Institute (NCI), the National Institute of Occupational Safety and Health (NIOSH), and the Occupational Safety and Health Administration (OSHA). Another consideration made in selecting the substances was their use in New Jersey. A copy of the survey and instructions are included in Appendix B. Approximately 13,000 companies have been surveyed to date. New Jersey hopes to use results of its industrial survey project to update and revise its regulatory program although DEP is uncertain exactly how the results are used.

Monitoring Program

DEP's Office of Cancer and Toxics Substances Research (OCTSR) is responsible for multimedia analysis of environmentally toxic and carcinogenic substances. A major part of OCTSR's effort is devoted to the monitoring of various airborne organic and toxic substances at various sites in New Jersey. This project represents the most comprehensive monitoring effort for airborne toxic substances ever initiated by a Federal or state agency.[6] Several papers dealing with New Jersey's monitoring efforts were presented recently at the June 21-25 meeting of the Air Pollution Control Association (APCA) in New Orleans, Louisiana. A listing of these papers is given in Appendix C. Since these papers provide much of

TABLE 4. LIST OF SUBSTANCES INCLUDED IN NEW JERSEY'S INDUSTRIAL SURVEYS PROJECT

HALOGENATED ALKANES AND ALKENES
Allyl chloride (1-Chloro-2-propene)
Bromoform (Tribromomethane)
Carbon tetrachloride
Chloroform
Chloroprene (2-Chloro-1,3-butadiene)
1,2-Dibromoethane (Ethylene dibromide)
Dichlorobromomethane
1,2-Dichloroethane (Ethylene dichloride)
1,2-Dichloroethylene
1,2-Dichloropropane
1,3-Dichloropropylene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Methyl bromide
Methyl chloride
Methylene chloride (Dichloromethane)
1,1,2,2-Tetrachloroethane
Tetrachloroethylene (Perchloroethylene)
1,1,1-Trichloroethane (Methyl chloroform)
1,1,2-Trichloroethane
Trichloroethylene
Trichlorofluoromethane
Vinyl Bromide
Vinyl chloride
Vinylidene chloride (1,1-Dichloroethylene)

PHENOLS
2-Chlorophenol
2,4-Dichlorophenol (DCP)
2,4-Dimethylphenol (m-xylenol)
4,6-Dinitro-o-cresol
2,4-dinitrophenol
2-Nitrophenol
4-Nitrophenol
Pentachlorophenol (PCP)
Phenol
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol

HALOGENATED AROMATICS

Chlorobenzene
2-Chloronaphthalene

HALOGENATED AROMATICS (Continued)
Decabromodiphenyl oxide
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Hexachlorobenzene
Polybrominated biphenyls (PBBs)
Polychlorinated biphenyls (PCBs)
Polychlorinated Triphenyls (PCTs)
1,2,4-Trichlorobenzene

PHTHALATES
Bis (2-ethylhexyl) phthalate
Butyl benzyl phthalate
Di-n-butyl phthalate
Diethyl phthalate
Di-n-octyl phthalate
Dimethyl phthalate

ETHERS, EPOXIDES, ALDEHYDES AND ANHYDRIDES
Acrolein
Bis (2-chloroethyl) ether
Bis (2-chloromethyl) ether
Diepoxybutane
Dioxane
Epichlorohydrin (1-chloro-2,3-epoxypropane)
Formaldehyde
Maleic anhydride
β-Propiolactone
Propylene oxide

IMINES, NITRILES AND HYDRAZINES
Acrylonitrile
1,1-Dimethyl hydrazine
Ethyleneimine (Aziridine)
Hydrazine
Propyleneimine

NITROSO COMPOUNDS

N-Nitrosodiethylamine
N-Nitrosodimethylamine
p-Nitrosodimethylaniline
N-Nitrosodiphenylamine
p-Nitrosodiphenylamine

TABLE 4. (CONTINUED)

AMIDES AND AMINO COMPOUNDS
Acetamide
Aniline (and salts)
2-Aminoanthraquinone
p-Aminoazobenzene
Benzamide
Benzidine
2,4-Diaminotoluene
3,3'-Dichlorobenzidine
4,4'-Methylene bis (2-chloroaniline)(MOCA)
α-Napthylamine
β-Napthylamine

PESTICIDES
Aldrin
BHCs & Lindane
Captan
Carbaryl (1-Naphthalenol Methyl Carbamate)
Cloramben
Chlordane
Chlorobenzilate
2,4-D
DDT
1,2-Dibromo-3-chloropropane (DBCP)
Dieldrin
Endosulfan
Endrin
Heptachlor
Kelthane (Dicofol)
Kepone
Methoxychlor
Mirex
Parathion
Penthachlorophenol
Quintozene (PCNB)(Pentachloronitrobenzene)
Strobane (Terpene polychlorinates)
2,4,5-T (2,4,5-(Trichlorophenoxy)acetic acid)
Toxaphene

AROMATIC HYDROCARBONS
Anthracene
Benzene
Biphenyl
Ethyl benzene
Napthalene
Toluene

INORGANICS (INCLUDE SALTS OF THESE COMPOUNDS)
Antimony
Arsenic
Beryllium
Cadmium
Calcium cyanamide
Chromium
Copper
Cyanide
Lead
Mercury
Nickel
Selenium
Silver
Thallium
Zinc

NITRO COMPOUNDS
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Nitrobenzene
2-Nitropropane

DYES
Brilliant Blue FCF salts
(Sodium) Blue VRS
C.I. Solvent Yellow 2
Citrus Red No. 2
C.I. Vat Yellow 4
Direct Black 38
Direct Blue 6
Direct Brown 95
C.I. Disperse Yellow 3
Fast Green 0
Guinea Green B
Light Green SF
Oil Orange SS
Ponceau MX
Ponceau 3R
Rhodamine B
Rhodamine 6G
Sudan I
Sudan II

MISC.
Asbestos
Thiourea
Phosgene

the detailed technical information concerning New Jersey's monitoring efforts, only a brief summary is presented in this report.

OCTSR is concentrating its monitoring efforts on the substances listed in Table 5. Several criteria were used in selecting the substances to be included in the monitoring program:

1. production, use, and number of sources;
2. toxicity and carcinogenicity;
3. regulation;
4. future air quality trends; and
5. available monitoring and analytical technology.

Production, use, and number of sources was a very important criterion. If a particular substance is not produced in New Jersey, has few industries that use it, and has a limited number of emission sources, the substance was not included on the list regardless of how toxic it might be. Of the substances which were widely produced or used in New Jersey, the primary focus was on documented occupational carcinogens; animal carcinogens; and substances with the potential to cause chronic, long-term health problems. Several suspected carcinogens widely used in New Jersey are also included. OCTSR tried to select substances which it felt might be subject to some future Federal regulations or standards. OCTSR also tried to include substances that may be emitted in steadily increasing quantities in the future. For example, OCTSR expects the number of coal-fired boilers and municipal waste, sewage sludge and hazardous waste incinerators to increase rapidly over the next decade. These sources may result in increased ambient concentrations of inhalable particulates, particulate organic matter, and trace elements. Thus, the current monitoring effort can serve as a base-line for future air quality changes in New Jersey. Another important criterion was available monitoring and analytical technology. If monitoring and analytical techniques for a particular substance were not

TABLE 5. SUBSTANCES SELECTED FOR STUDY IN NEW JERSEY'S AMBIENT MONITORING PROGRAM

Particles

Inhalable Particulate Matter ($\leq$15u)
Fine Particulate Matter ($\leq$2.5u)
Trace Metals (As, Cd, Cr, Cu, Fe, Mn, Ni, Pb, V, Zn)
Sulfate
Particulate Organic Matter (Three extracts)
Polycyclic Aromatic Hydrocarbons (Fourteen compounds)

Gas-phase Pollutants

Acrylonitrile
Benzene
Carbon Tetrachloride
Chlorobenzene
Chloroform
ortho-Chlorotoluene
para-Chlorotoluene
ortho-Dichlorobenzene
para-Dichlorobenzene
1,1-Dichloroethylene
1,4-Dioxane
Ethylbenzene
Ethylene Dichloride
Methylene Chloride
Nitrobenzene
Perchloroethylene
Styrene
1,1,2,2 - Tetracholoroethane
Toluene
1,1,2 - Trichloroethane
Trichloroethylene
Vinyl Chloride
meta-Xylene
ortho-Xylene
para-Xylene

available or were prohibitively expensive, the substance was not included for study in the program.

In addition to monitoring for the substances listed in Table 5, OCTSR routinely conducts Ames tests and alkylating activity tests on ambient air samples.

Monitoring is conducted at four residential sites within the State - three near major industrialized facilities and roadways, and one in a rural area with no industrial sources or major roadways nearby. Monitoring is being conducted on a 24-hour basis, 7 days per week, for six weeks in the summer and winter. The monitoring program is expected to continue for 3 years. New Jersey's DEP hopes that monitoring results can be used to review and revise the air toxics program, although DEP is uncertain as to exactly how and when the results will be used.

Resource Center

OCTSR's resource center provides support for the research and regulatory activities. The resource center houses environmental, chemical, and medical journals. It also contains many IARC, NIOSH, OSHA, and Environmental Protection Agency (EPA) documents pertaining to toxic and carcinogenic substances. Computer facilities are also available and are used mostly for computer-assisted literature searches.

Department of Health Research Activities

The New Jersey Department of Health (DOH) has been conducting health studies of hazardous waste sites and a few industrial facilities for about one year. Most of DOH's research on air toxics is being conducted by its Occupational and Environmental Health Services group. This group is currently conducting, or has plans to conduct, three types of health studies: cross-sectional, mortality, and case-control. In a cross-sectional study a sample of people living near a dumpsite or industrial facility is selected. The health records of the sample are compared to those of a control group in an attempt to determine the effects of certain pollutants. A mortality study involves tracing former residents of an area near a dumpsite or industrial facility and comparing the number of deaths of these former residents to that of a control group. Results of this type of study would indicate whether mortality rates are higher for people living near a dumpsite or industrial facility than for the general population. In a case control study, the potential for a particular substance to cause a particular health problem is evaluated. For instance, in one case-control study DOH is trying to determine the potential of vinyl chloride for causing central nervous system birth defects.

DOH stated that air and/or water monitoring may be conducted for health studies but is not necessarily conducted for all studies. DOH also mentioned that although some air monitoring is performed, water monitoring is conducted more frequently. DOH currently monitors for approximately 50 substances with the aid of a gas chromatograph/mass spectrometer (GC/MS). In addition, DOH conducts medical surveys for some of its health studies which may include testing and analysis of respiratory functions, pulmonary functions, or any other organs.

The research being performed by the Occupational and Environmental Health Services group is being funded out of the New Jersey Spill Fund. This group received a one-time appropriation of $250,000 but anticipates that additional funds may be made available on an annual basis. Approximately 12 people, including two epidemiologists and two toxicologists are directly involved in the research efforts described above. The Department of Health also maintains an analytical laboratory which has GC/MS and atomic absorption capabilities.

Another group within DOH whose work could potentially impact air toxics policy is Cancer Epidemiological Services. This group maintains a cancer registry whereby all cases of cancer are reported to the group. Cancer Epidemiological services also maintains a cancer map, using death certificates to determine the total rates of cancer deaths and deaths due to a particular cancer, by region and municipality. Cancer Epidemiological Services is also conducting a case-control study to determine what occupational or environmental factors might potentially cause cancer.

ADMINISTRATIVE ISSUES

Program Operation to Date

New Jersey's DEP has stated that 170 industrial facilities and 1300 dry cleaners have submitted TVOS registrations. Many of these facilities contain multiple emission sources. For each industrial facility which has submitted a registration, DEP speculates that there is at least one other which has not done so. Since sources were required to register within 6 months of the effective date of Subchapter 17 (December 1979), those facilities which failed to submit registrations are in violation of Subchapter 17. If these facilities are identified by DEP, they could be subject to penalties.

Although, to date, New Jersey has not completed any enforcement actions other than for sources which failed to submit permit applications for TVOS, one enforcement action involving sources whose controls were judged unacceptable by DEP is currently in progress. DEP's enforcement approach involves issuing administrative orders — "orders of abatement" requiring affected facilities to submit compliance schedules. To date there have been no legal challenges of Subchapter 17.

DEP has plans for updating its list of TVOS and evaluating the criteria for selecting compounds to be controlled. DEP is just beginning this evaluation and anticipates that 1-2 years will probably be needed to complete this revision process.

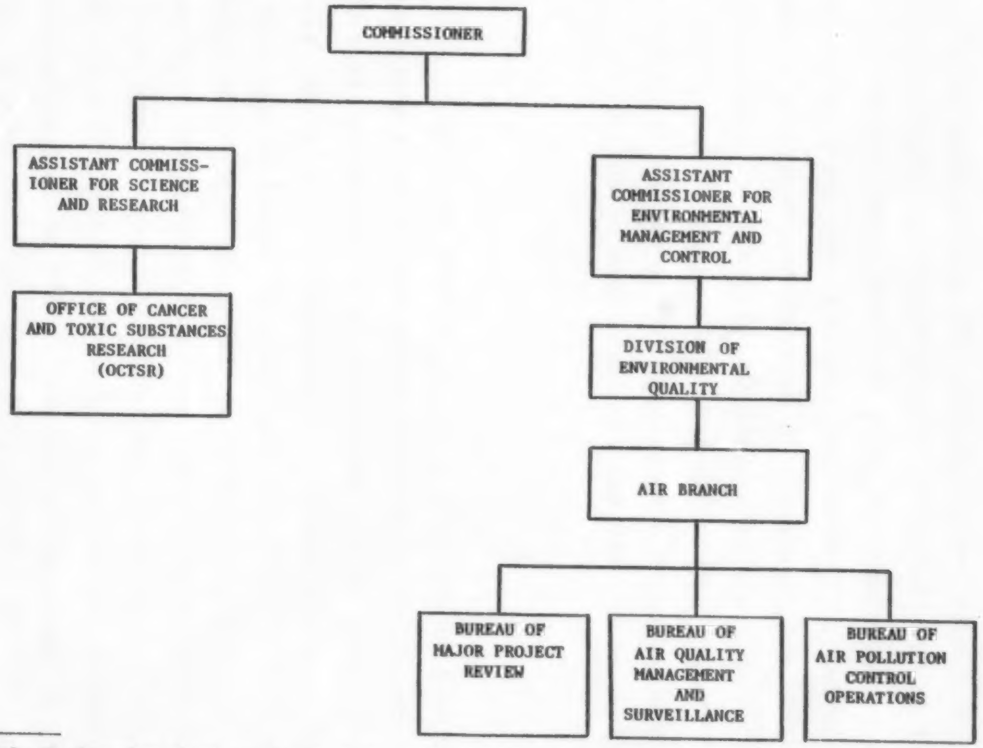
Emergency Response

New Jersey's DEP said that it currently has no detailed approach for dealing with air toxics emergencies as a result of fires, explosions, transportation accidents, etc. However, DEP does respond to all such incidents. DEP stated that it is very difficult to pinpoint a concentration at which evacuation should be required. DEP uses data published by the Federal Department of Transportation (DOT) and the U. S. Coast Guard to aid in these decisions, however. To date DEP has never had to make any decisions concerning evacuation where Subchapter 17 compounds were involved. DEP stated that in New Jersey the ultimate decision and authority for evacuating an area belongs to the State Police who may rely on recommendations of the DEP and the Department of Health.

State Organization

The Department of Health and the Department of Environmental Protection are two distinct agencies within New Jersey's state government. An organizational chart of the Department of Environmental Protection is shown in Figure 3. DEP's Air Branch conducts the air toxics regulatory program in addition to other air programs. Personnel involved in the air toxics program are drawn from three of the Air Branch's four Bureaus: the Bureau of Major Project Review; the Bureau of Air Quality Management and Surveillance; and the Bureau of Air Pollution Control Operations. All personnel involved in air toxics are also involved in other air programs. In other words, no single group has been formed to work exclusively on the air toxics program. DEP's Office of Cancer and Toxic Substance Research (OCTSR) conducts air toxics research as a part of its multimedia research efforts. The Department of Health is conducting research on emissions from hazardous waste sites independently of DEP. Approximately eight people employed by the Department of Health are involved in these environmental research efforts.

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION[a]


COMMISSIONER
ASSISTANT COMMISSIONER FOR SCIENCE AND RESEARCH
OFFICE OF CANCER AND TOXIC SUBSTANCES RESEARCH (OCTSR)
ASSISTANT COMMISSIONER FOR ENVIRONMENTAL MANAGEMENT AND CONTROL
DIVISION OF ENVIRONMENTAL QUALITY
AIR BRANCH
BUREAU OF MAJOR PROJECT REVIEW
BUREAU OF AIR QUALITY MANAGEMENT AND SURVEILLANCE
BUREAU OF AIR POLLUTION CONTROL OPERATIONS

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[a] Note: Only the branches which are involved in conducting New Jersey's air toxics program are shown.

Figure 3. New Jersey Department of Environmental Protection Agency organizational chart.

Currently, DEP handles all enforcement matters pertaining to air toxics. However, the counties are in the process of developing plans to assist the State. New Jersey has five regional agencies that are responsible for handling citizen complaints; addressing smoke, odor, and emergency breakdown problems; and performing some inspections.

Level of Effort Required

New Jersey DEP found it difficult to estimate the number of manhours effort involved in its air toxics program because everyone involved in the air toxics program is also involved in other air programs. However, New Jersey's DEP stated that its air toxics program represents about 10 percent of the total budget for air pollution control. Research monitoring efforts were estimated to cost an additional $500,000 per year.

New Jersey received a Section 28 grant under the Toxic Substances Control Act (TSCA) most of which is being used to purchase a mobile trailer equipped with a gas chromatograph - mass spectrometer (GC/MS). This trailer should aid OCTSR in its research monitoring efforts. Currently, most of the Agency's toxics monitoring efforts are conducted on a contract basis.

New Jersey Evaluation of its Air Toxics Program

New Jersey's DEP maintains that its engineering approach, which requires BACT for all sources emitting TVOS, is the best method for dealing with air toxics. DEP does not conduct any formalized risk assessments for air toxics because they think it is impossible to determine an "acceptable" risk. Moreover, DEP has stated that basing a toxics program solely on acceptable ambient levels is not good engineering practice because facilities can increase stack heights or expand boundaries in order to reduce ground-level concentrations without reducing stack emissions.

DEP also mentioned that, although its surveys provide useful information, the industrial survey project is sometimes unmanageable in a state as industrialized as New Jersey. DEP feels that it will never have a perfect inventory of every facility because each stack or discharge point is not inventoried and emissions or discharges are constantly changing. The inventory is very extensive and each response must be verified by DEP personnel. By the time all the information can be compiled and verified, much of it is obsolete. DEP provided one example of the magnitude of the task of using surveys in New Jersey. One industrial facility in New Jersey has 11,000 stacks — to date, only 3000 of these stacks have been inventoried. However, DEP thinks that industrial surveys would benefit states with fewer sources.

New Jersey's DEP stressed that the biggest obstacle facing its air toxics program is money. The air toxics program is very expensive to implement and maintain, and it is difficult to obtain the financial support needed.

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APPENDIX B

INDUSTRIAL SURVEYS

TABLE 1
SELECTED SUBSTANCES

Environmental Protection

Let's protect our earth

All chemical compounds and/or complexes containing a selected substance (including organic, inorganic and organo-metallics) are to be reported under the given CAS code Number and identified on the survey form.

CAS NO.	HALOGENATED ALKANES AND ALKENES
107-05-1	Allyl chloride (1-Chloro-2-propene)
75-25-2	Bromoform (Tribromomethane)
56-23-5	Carbon tetrachloride
67-66-3	Chloroform
126-99-8	Chloroprene (2-Chloro-1, 3-butadiene)
106-93-4	1,2-Dibromoethane (Ethylene dibromide)
75-27-4	Dichlorobromomethane
107-06-2	1,2-Dichloroethane (Ethylene dichloride)
540-59-0	1,2-Dichloroethylene
78-87-5	1,2-Dichloropropane
542-75-6	1,3-Dichloropropylene
87-68-3	Hexachlorobutadiene
77-47-4	Hexachlorocyclopentadiene
67-72-1	Hexachloroethane
74-83-9	Methyl bromide
74-87-3	Methyl chloride
75-09-2	Methylene chloride (Dichloromethane)
79-34-5	1,1,2,2-Tetrachloroethane
127-18-4	Tetrachloroethylene (Perchloroethylene)
71-55-6	1,1,1-Trichloroethane (Methyl chloroform)
79-00-5	1,1,2-Trichloroethane
79-01-6	Trichloroethylene
75-69-4	Trichlorfluoromethane
593-60-2	Vinyl Bromide
75-01-4	Vinyl chloride
75-35-4	Vinylidene chloride (1,1-Dichloroethylene)

CAS NO.	PHENOLS
95-57-8	2-Chlorophenol
120-83-2	2,4-Dichlorophenol (DCP)
105-67-9	2,4-Dimethylphenol (m-xylenol)
534-52-1	4,6-Dinitro-o-cresol
51-28-5	2,4-dinitrophenol
88-75-5	2-Nitrophenol
100-02-7	4-Nitrophenol
87-86-5+	Pentachlorophenol (PCP)
108-95-2	Phenol
*95-95-4	2,4,5-Trichlorophenol
88-06-2	2,4,6-Trichlorophenol

CAS NO.	HALOGENATED AROMATICS
108-90-7	Chlorobenzene
91-58-7	2-Chloronaphthalene
*1163-19-5	Decabromodiphenyl oxide
95-50-1	1,2-Dichlorobenzene
541-73-1	1,3-Dichlorobenzene
106-46-7	1,4-Dichlorobenzene
118-74-1	Hexachlorobenzene
13654-09-6	Polybrominated biphenyls (PBBs)
11097-69-1	Polychlorinated biphenyls (PCBs)
*1264-23-8	Polychlorinated Triphenyls (PCTs)
120-82-1	1,2,4-Trichlorobenzene

CAS NO.	PHTHALATES
117-81-7	Bis (2-ethylhexyl) phthalate
85-68-7	Butyl benzyl phthalate
84-74-2	Di-n-butyl phthalate
84-66-2	Diethyl phthalate
117-84-0	Di-n-octyl phthalate
131-11-3	Dimethyl phthalate

CAS NO.	ETHERS, EPOXIDES, ALDEHYDES AND ANHYDRIDES
107-02-8	Acrolein
111-44-4	Bis (2-chloroethyl) ether
542-88-1	Bis (2-chloromethyl) ether
1462-53-5	Diepoxybutane
123-91-1	Dioxane
106-89-8	Epichlorohydrin (1-chloro-2,3-epoxypropane)
50-00-9	Formaldehyde
108-31-6	Maleic anhydride
57-57-8	β-Propiolactone
75-56-9	Propylene oxide

CAS NO.	AMINES, NITRILES AND HYDRAZINES
107-13-1	Acrylonitrile
57-14-7	1,1-Dimethyl hydrazine
151-56-4	Ethyleneimine (Aziridine)
302-01-2	Hydrazine
75-55-8	Propyleneimine

CAS NO.	NITROSO COMPOUNDS
55-18-5	N-Nitrosodiethylamine
62-75-9	N-Nitrosodimethylamine
138-89-6	p-Nitrosodimethylaniline
86 30-6	N-Nitrosodiphenylamine
156-10-5	p-Nitrosodiphenylamine

CAS NO.	AMIDES AND AMINO COMPOUNDS
60-35-5	Acetamide
62-53-3	Aniline (and salts)
117-79-3	2-Aminoanthraquinone
60-09-3	p-Aminoazobenzene
*55-21-0	Benzamide
92-87-5	Benzidine
95-80-7	2,4-Diaminotoluene
91-94-1	3,3'-Dichlorobenzidine
101-14-4	4,4'-Methylene bis (2-chloroaniline) (MOCA)
134-32-7	α-Napthylamine
91-59-8	β-Napthylamine

CAS NO.	PESTICIDES
309-00-2	Aldrin
58-89-9	BHCs &Lindane
133-06-2	Captan
63-25-2	Carbaryl (1-Naphthalenol Methyl Carbamate)
133-90-4	Cloramben
57-74-9	Chlordane
510-15-6	Chlorobenzilate
74-75-7	2,4-D
50-29-3	DDT
96-12-8	1,2-Dibromo-3-chloropropane (DBCP)
60-57-1	Dieldrin
115-29-7	Endosulfan
72-20-8	Endrin
76-44-8	Heptachlor
115-32-2	Kelthane (Dicofol)
143-50-0	Kepone
*72-43-5	Methoxychlor
2385-85-5	Mirex
56-38-2	Parathion
87-86-5	Pentachlorophenol
82-68-8	Quintozene (PCNB) (Pentachloronitrobenzene)
61789-48-2	Strobane (Terpene polychlorinates)
93-76-5	2,4,5-T (2,4,5-(Trichlorophenoxy) acetic acid)
8001-35-2	Toxaphene

CAS NO.	AROMATIC HYDROCARBONS
120-12-7	Anthracene
71-43-2	Benzene
92-52-4	Biphenyl
100-41-4	Ethyl benzene
91-20-3	Napthalene
108-88-3	Toluene

CAS NO.	INORGANICS (INCLUDE SALTS OF THESE COMPOUNDS)
7440-36-0	Antimony
7440-38-2	Arsenic
7440-41-7	Beryllium
7440-43-9	Cadmium
156-62-7	Calcium cyanamide
7440-47-3	Chromium
7440-50-8	Copper
57-12-5	Cyanide
7439-92-1	Lead
7439-97-6	Mercury
7440-02-0	Nickel
7782-49-2	Selenium
7440-22-4	Silver
7440-28-0	Thallium
7440-66-6	Zinc

CAS NO.	NITRO COMPOUNDS
121-14-2	2,4-Dinitrotoluene
606-20-2	2,6-Dinitrotoluene
98-95-3	Nitrobenzene
79-46-9	2-Nitropropane

CAS NO.	DYES
2650-18-2	Brilliant Blue FCF salts
129-17-9	(Sodium) Blue VRS
60-11-7	C.I. Solvent Yellow 2
6358-53-8	Citrus Red No. 2
128-66-5	C.I.Vat Yellow 4
1937-37-7	Direct Black 38
2602-46-2	Direct Blue 6
10300-74-0	Direct Brown 95
2832-40-8	C.I. Disperse Yellow 3
569-64-2	Fast Green 0
4680-78-8	Guinea Green B
5141-20-8	Light Green SF
2646-17-5	Oil Orange SS
3761-53-3	Ponceau MX
3564-09-8	Ponceau 3R
81-88-9	Rhodamine B
989-38-8	Rhodamine 6G
842-07-6	Sudan I
3118-97-6	Sudan II

CAS NO.	MISC.
1332-21-4	Asbestos
62-56-6	Thiourea
*75-44-5	Phosgene

*Denotes substances proposed for inclusion in the Industrial Survey but not yet adopted. It is anticipated they will be officially adopted within one month. Your cooperation at this time will be greatly appreciated.

Form COM-021 A
Rev. 2/80

ID ☐☐☐☐☐

CM ☐☐☐☐

State of New Jersey
Department of Environmental Protection

OFFICE OF THE COMMISSIONER

Return forms to:
INDUSTRIAL SURVEY PROJECT
P.O. BOX 251
TRENTON, NEW JERSEY 08602

SELECTED SUBSTANCE REPORT

PART I – General Plant Information

COMPLETE ONE REPORT FOR EACH PLANT SITE OR FACILITY LOCATION

1. Company Name ______
2. Division or Plant Name ______
3. Mailing Address (Street) ______
   (City/Town) ______ County ______ State ______ Zip Code ______
4. Plant Location Address (Street) ______
   (If not as above)
   (City/Town) ______ County ______ State ______ Zip Code ______
5. Date Plant Began Operations At This Location ______
6. Person to Contact Regarding this Report ______ Title ______
7. Phone Number (Area Code) ______
8. SIC Code (Four Digit) ______ Standard Industrial Classification (if available)
9. Nature of Business ______
10. Number of Production Employees at this Plant Site ______
11. Does this plant manufacture, process, form, repackage, release, use, dispose of or store any of the selected substances shown on Table I of the enclosed instructions? (Check One) YES ☐ NO ☐

If your answer to number 11 is "YES", complete the Entire Report for your facility, sign and return.

If your answer to number 11 is "NO", complete Question 15, sign and return.

I, HEREBY, CERTIFY THAT ALL STATEMENTS MADE BY ME IN THIS REPORT ARE TRUE, COMPLETE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND THAT ESTIMATES WHERE USED HAVE BEEN MADE IN GOOD FAITH.

NAME (Print) ______ Signature ______

Title ______ Date ______

12A. Sketch (On the reverse side of this page) or attach a copy of a map indicating the exact location of the plant site.

12B. Supply your Dun & Bradstreet number if available. ______

FOR OFFICIAL USE ONLY

E	☐☐☐☐	S	☐☐☐☐	N	☐☐☐☐☐
B	☐☐☐	O	☐	A	☐
C	☐		______	X	☐☐☐☐☐☐☐☐☐
V	☐		______	D & B	☐☐☐☐☐☐☐☐☐

FOR DEP USE ONLY

PART I – General Information (continued)

13. List all of the selected substances included in this report along with their CAS Numbers (From Table I of the Instructions) which are manufactured, processed, formed, repackaged, released, used, disposed of or stored at the plant site:

14. Wastewater Discharges – Complete the following information:

A. Discharge to publicly owned treatment works (POTW):

1. Name of Utility (POTW) ____

   Address/Location ____

2. Estimated Average Volume of Wastewater Discharged to POTW in a day

   ____ gallons.

3. Briefly describe any pretreatment methods ____

4. Wastewater consists of: ( ) Process Water, ( ) Contact Cooling, ( ) Non-Contact Cooling, ( ) Domestic Sewage, ( ) Contaminated Storm Water, ( ) Washdown Water, ( ) Scrubber Water, ( ) Other: ____

B. Discharge to Navigable Waterway or Tributary Stream:

1. Name of Receiving Stream ____

2. NPDES Permit Number ____

3. Estimated average volume of wastewater discharged to receiving stream in a day

   ____ gallons.

4. Briefly describe any treatment methods ____

5. Wastewater consists of: ( ) Process Water, ( ) Contact Cooling, ( ) Non-Contact Cooling, ( ) Domestic Sewage, ( ) Contaminated Storm Water, ( ) Washdown Water, ( ) Scrubber Water, ( ) Other: ____

15. Previous disposal practices (1930–1977). Has this plant previously disposed of wastes containing any of the selected substances at any land disposal site (i.e. by land spreading or burial, landfilling, lagoon or seepage pit) either on or off site?

YES ☐ NO ☐

If available provide the following information for each disposal site. Use additional pages if necessary.

Name and Location of Site ____

Time period site was used ____

Name of selected substances disposed of at this site	Physical State	Amount of selected substance disposed at site (pounds)

Form COM-021 B
Rev. 2/80

page ______ of ______

State of New Jersey
Department of Environmental Protection

ART II

SELECTED SUBSTANCE REPORT

OMPLETE ONE FORM FOR EACH SELECTED SUBSTANCE

FOR DEP USE

Name and Location of Plant	I.D.
Selected Substance Name / CAS #	
Briefly Describe Its Use On The Site:	

COMPLETE THE FOLLOWING INFORMATION FOR THE PLANT BASED ON 1978 USAGE	ENTER THE ACTUAL OR ESTIMATED AMOUNTS	USE THE REQUESTED UNITS	CHECK ONE	
			ACTUAL	ESTIMATED
4. QUANTITY PRODUCED ON SITE		lbs/yr.		
5. QUANTITY BROUGHT ONTO SITE		lbs/yr.		
6. QUANTITY CONSUMED ON SITE		lbs/yr.		
7. QUANTITY SHIPPED OFF SITE AS (OR IN) PRODUCT		lbs/yr.		
8. MAXIMUM INVENTORY		lbs		
9. TOTAL STACK EMISSIONS OF SELECTED SUBSTANCE		lbs/yr.		
		max lbs/day		
10. TOTAL FUGITIVE EMISSIONS OF SELECTED SUBSTANCE		lbs/yr.		
		max lbs/day		
11. TOTAL DISCHARGE OF SELECTED SUBSTANCE INTO SURFACE WATER		lbs/yr.		
		max lbs/day		
12. TOTAL DISCHARGE OF SELECTED SUBSTANCE INTO PUBLICLY OWNED TREATMENT WORKS		lbs/yr.		
		max lbs/day		

3. DISPOSAL OF WASTE CONTAINING THE SELECTED SUBSTANCE

LOCATION OF FINAL DISPOSAL SITE NAME AND ADDRESS	PHYSICAL STATE TABLE A	DISPOSAL METHOD TABLE B	QUANTITY OF SELECTED SUBSTANCE DISPOSED (lbs)	FOR DEP USE

TABLE A
PHYSICAL STATE

W-01 Solid
W-02 Liquid
W-03 Slurry
W-04 Sludge
W-09 Other (specify)

TABLE B
DISPOSAL METHODS

W-01 Composting
W-02 Evaporation
W-03 Holding Tank
W-04 Incineration
W-05 Injection Well
W-06 Lagoon
W-07 Land Burial
W-08 Land Spreading
W-09 Neutralization
W-10 Ocean
W-11 Recycling
W-12 Sanitary Landfill
W-13 Surface Water
W-14 Subsurface System
W-15 Pyrolysis
W-16 Spray Irrigation
W-17 Stored On Site
W-98 Other (specify)

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State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
[illegible]

INDUSTRIAL SURVEY PROJECT
INSTRUCTIONS

I. GENERAL INFORMATION

The Industrial Survey Project is part of an effort by the Department of Environmental Protection (DEP) to assemble a computerized data base on the uses and release into the environment of about 155 carcinogenic and toxic chemicals. The enclosed questionnaire forms, entitled "Selected Substance Report", will be mailed to approximately fifteen thousand industrial establishments in the State of New Jersey over a year's time. When returned to the Department, the information contained on them will be coded for entry and stored in a computer system. The data will then be correlated with other information, such as death and disease statistics, to try to identify areas of the state and population groups who may be subjected to an increased risk of disease due to chemical exposure.

The Industrial Survey Project is being conducted by DEP's Toxic Substances Program. If you have questions about the survey or the questionnaire forms, or if you need additional information, you may contact:

Industrial Survey Project
P.O. Box 251
Trenton, New Jersey 08602

Tel. (609) 292-0647

Participation in the Industrial Survey is mandatory. Willful failure to return a completed Selected Substance Report may result in legal action against your firm. You will be notified by letter before any legal action is brought, however, and given adequate time to submit the report if it has been lost or delayed for any legitimate reason.

Regulations governing the Industrial Survey Project have been adopted and codified as Chapter 1F of Title 7 of the New Jersey Administrative Code (N.J.A.C. 7:1F-1.1 et seq.). These regulations describe the project in somewhat greater detail, provide for the protection of confidential information submitted by survey respondents, and set penalties for persons who fail to return questionnaires or who make unauthorized disclosures of confidential information. You may obtain copies of the regulations by contacting the Industrial Survey Project at the above address.

II. CONFIDENTIAL BUSINESS INFORMATION

If any question on the Selected Substance Report requires you to submit information which is (or would lead a knowledgeable reader to deduce from it) a trade secret, proprietary business information or information related to national security, you may make a confidentiality claim. DEP will then treat that information as confidential and not disclose it in any form that would reveal the secret or proprietary information, unless the Department makes a formal finding that the material is not entitled to confidential treatment under the regulations. Unless an emergency (such as a fire in your plant which threatens to expose nearby residents to toxic materials) calls for the immediate release of information, you will be notified in advance if the Department intends to disclose information that you have claimed as confidential. You will be given an opportunity to challenge the Department's decision through administrative processes, and if not satisfied with the outcome, you will be given time (except in an emergency situation) to obtain a restraining order from a court, if you wish to pursue an appeal.

To make a confidentiality claim for information contained in the Selected Substance Report you must do the following:

1. Submit two copies of the report. The first must contain all the information requested. The second should contain no information which you believe entitled to confidential treatment. (The second copy can be a photocopy of the first with the confidential material blacked or whited out.)

2. Mark the top of each page containing confidential information with the heading "CONFIDENTIAL" in bold type, stamp or hand lettering. Do not mark every page - only the ones that contain confidential information.

3. Identify all information which you claim to be confidential by underlining or highlighting it in a clear manner. Translucent ink markers are acceptable for this purpose.

Example: Question 6. Quantity Consumed On Site = 140,500 lbs/yr.

4. Seal the copy of the report which contains confidential information into an envelope, and mark the envelope on both sides with the word "CONFIDENTIAL" in bold type, stamp or hand lettering. Place this envelope, together with the second (non-confidential) copy of the report, inside another envelope for transmittal to the Industrial Survey Project.

5. Send the complete package to the Industrial Survey Project at the address listed in Part III, Instruction C, below. For your own protection, we recommend the use of certified mail, return receipt requested, a messenger service, personal delivery, or some other means that will give you verification that the Project has received your material. You may use ordinary mail, but the Project assumes no responsibility for materials not signed for until they are actually received in the project office.

Please give careful consideration to what material you claim as confidential. Be sure it really is proprietary or a trade secret. Do not mark a report "Entire Contents Confidential" or in some similar fashion. Doing so will result in the Project refusing to recognize any confidentiality claim, or in our sending it back to you to be revised. You should also be aware that under State and federal laws, emissions of toxic materials into the environment are not entitled to be kept confidential.

III. INSTRUCTIONS FOR COMPLETING THE SELECTED SUBSTANCE REPORT

General Instructions

A. The data requested are to be supplied as they pertain to the selected substances of concern to the Department of Environmental Protection listed in Table 1 (attached). If your plant does not manufacture, process, form, repackage, release, use, dispose of or store any of the selected substances, either as a pure substance or as part of a mixture; and has not disposed of selected substances by landfilling, lagooning, underground injection or other subsurface methods in past years since 1930, only Items 1 through 10 of Part I need be completed.

B. If you have more than one plant location, a separate complete report must be filed for each location. However, you will receive a separate survey package for each plant location on file with the State.

C. The report forms are to be completed and returned within 90 days addressed to:

Industrial Survey Project
P.O. Box 251
Trenton, New Jersey 08602

Be sure to address the envelope exactly as shown in the box above. Do not add references to "Department of Environmental Protection" or "State of New Jersey" as this may cause misrouting of mail.

If you use a messenger service or deliver the forms in person, return them to:

Room 803, Labor & Industry Building
John Fitch Plaza
Trenton, New Jersey
ATTN: Edward Stevenson or Judith Louis

NOTE: The 90 day deadline may be extended by the Project for additional periods, not to exceed 90 days each, for good cause shown by the respondent.

D. All information is to be based on calendar year 1978, if possible. If information for 1978 is not readily available, contact the Industrial Survey Project (609-292-0647) for further instructions.

E. Please give your answers in terms of the units specified in the forms (i.e., pounds per year, maximum pounds per day, gallons per day, etc.). Leave boxes marked "DEP use only" blank.

F. Complete all sections of the report that pertain to your firm or plant site. If a section does not apply to your operations, write in "NA" for "not applicable".

G. Please attach process descriptions, explanatory notes, flow charts, lists, etc., that will assist in clarifying entries made on the report if you feel the answers require further explanation. If information needed to complete a section is not readily available, provide a written explanation describing the nature of the operations involved and the reasons for not supplying the data.

H. It is intended that you use existing or readily ascertainable data to complete the Selected Substance Report. Where quantities can be determined from existing records (e.g., inventory or production figures) or the cost of testing is nominal, actual figures are to be supplied. Otherwise, estimates may be given. You may use engineering estimates and computations; process material balance studies; field tests or measurements made by the plant, equipment manufacturers or government agencies, or other technically sound bases.

I. If you do not know the formulation of trade name chemicals you use in your plant operations, you should make reasonable inquiries of your supplier or the manufacturer to ascertain whether the material contains any selected substances. (For example, Tri-Clene a solvent, is a trade name for trichloroethylene, a selected substance.)

J. Exempt from this report are quantities of selected substances which are manufactured, used, formed or processed for purposes of scientific experimentation, analysis or chemical research (including research or analysis for product development), provided such quantities of each substance are less than 1,000 pounds in a one-year period.

Also exempted are quantities of selected substances which are present as impurities, without regard to the purpose for which the material in which such impurities are contained is produced, provided the concentration of selected substance present as impurity is less than 1% and the total amount of selected substance present as impurity is less than 1,000 pounds in a one-year period.

Example: You produce 100,000 pounds per year of xylene in which benzene is present as an impurity at a concentration of .65 percent. You do not have to report the presence of benzene since it is present in a concentration less than 1% and annual production is only 650 pounds.

Example: You produce 50,000 pounds per year of xylene in which benzene is present as an impurity at a concentration of 1.3 percent. You must report the presence of benzene because the concentration is greater than 1%, even though annual production is only 650 pounds.

Example: You produce 1,000,000 pounds per year of xylene in which benzene is present as an impurity at a concentration of .5 percent. You must report the presence of benzene, even though its concentration is less than 1%, because annual production is 5,000 pounds.

In the case of the third example (involving a concentration less than 1%) you would not be required to report the presence of the impurity unless you know or have reason to know of its presence. See paragraph H.

Specific Instructions

The Selected Substance Report is divided into two parts. Part I consists of 15 questions about the plant site, its operations and its use of selected substances. Part II consists of separate sheets, each of which is to be filled out with information about only one selected substance. Three copies of the form for Part II have been sent to you; if you need extra ones, you may make photocopies or request additional forms from the Project.

The questions in Part I should be self-explanatory. Refer to the following for guidance in completing Part II.

QUESTION 1 - enter the plant name and location.

QUESTION 2 - enter the name of the selected substance and the corresponding CAS number, as listed in Table 1.

QUESTION 3 - "use" refers to any use made of the selected substance at your plant site. It includes synthesis, whether the substance is incorporated into a finished product or produced only as an intermediate; use as raw material, where the substance is chemically changed or incorporated into another; mixing, blending, repackaging or transshipment; use as supplementary fuel or for cleaning, and anything else. If the substance is used for more than one purpose at your plant site, list all uses.

Example: vinyl chloride (monomer) is used in the production of polyvinyl chloride resin.

Example: 1,1,1 trichloroethane is used as a parts degreaser.

THROUGH-PUT QUANTITIES (Questions 4-8): These questions seek specific information about the quantities of selected substances used in your production or processing operations. The figures you supply in your answers to these questions will not necessarily give rise to a material balance. Some substances may be counted in more than one category. The Project is aware of this, and it has been taken into account in the design of the computer programs that will analyze the survey responses.

QUESTION 4 - Quantity Produced on Site: this refers to quantities of the substance synthesized in your plant production processes. It includes isolated intermediates (those drawn off and stored for later use in the production process), but not transient intermediates (i.e., substances formed in the production process as an intermediate step but immediately transformed into something else). Also included are by-products and quantities generated as impurities or waste.

QUESTION 5 - Quantity Brought onto Site: This refers to quantities of the substance brought into your plant from suppliers off-site, including other plants or divisions of your own firm. Include all quantities shipped onto the site, whether they are to be used as raw materials, cleaning materials, or simply repackaged for reshipment.

QUESTION 6 - Quantity Consumed on Site: In some cases a selected substance is consumed in a chemical reaction either through incorporation into the molecular structure of the product or by combining with a reactant or solvent to alter its structure and thus loses its identity.

Example: You make nitrobenzene by reacting benzene and nitric acid. Benzene is "consumed" in the production process because it undergoes chemical change and ceases to exist as benzene.

On the other hand, quantities of selected substance which are used in plant processes but not chemically transformed should not be listed as "consumed".

Example: You use trichloroethylene (TCE) as a degreasing agent for cleaning metal. Some of the chemical evaporates in the process, and the rest becomes too contaminated for reuse. These quantities should be recorded under "Air Emissions" and "Waste Disposal", not under "Quantity Consumed".

QUESTION 7 - Quantity Shipped Off-site As (or In) Product: The information sought here is the amount of selected substance that leaves your plant site in product form - that is, in a form suitable for final use or for further processing leading to eventual final use. This includes materials shipped to other plants or divisions of your own firm. It does not, however, include wastes; these should be recorded in the "Waste Disposal" section. Enter only the quantity of selected substance shipped off-site, not the quantity of product in which it is contained.

Example: You ship to customers 100,000 pounds per year of a mixture containing 10% by weight of isophorene, that is, 10,000 pounds of isophorene. Your answer to Question 7 should be 10,000 pounds, not 100,000.

QUESTION 8 - Maximum Inventory: In this question we are attempting to gain an idea of the quantities of selected substance stored on your site at a given moment in time. Since computing an average daily storage quantity would require averaging your daily inventory records over an entire year, to simplify your response we have requested only the maximum quantity stored. Enter the largest amount of selected substance you had in storage on-site at any time during 1978. Again, enter the quantity of substance only, not the amount of material in which it is contained.

AIR EMISSIONS (Questions 9 and 10): These questions seek to learn the amounts of selected substances your plant releases into the atmosphere from all sources. Please attach explanatory notes, itemized sources of emissons, calculations, etc., that will assist in clarifying your responses.

QUESTION 9 - Stack Emissions: These are emissions which are released into the atmosphere from a readily-identifiable point source, such as a chimney or exhaust vent.

QUESTION 10 - Fugitive Emissions: These are emissions other than stack emissions. Included should be such items as evaporation from tanks, vapor or dust emissions during blending, transfer or packaging operations, vapors given off from charging or discharging reaction vessels, etc.

WASTEWATER DISCHARGES (Questions 11 and 12): These questions are concerned only with discharges into surface waters or publicly owned treatment works (POTW's). Discharges into subsurface waters or onto land (e.g. lagooning, spray irrigation) should be recorded under the section on Waste Disposal. Here again, the questions are concerned only with the quantity of selected substance discharged, not with the volume of effluent in which it is contained. Thus, if you discharge a million gallons of effluent containing 500 pounds of selected substance, you enter 500 pounds for Question 11 or 12.

QUESTION 11 - Surface Water Discharges: Enter the total quantity of selected substance you discharged into surface water, other than quantities which went to surface waters via a POTW (Question 12).

QUESTION 12 - Discharge into Publicly Owned Treatment Works: Enter the total quantity of selected substance you discharged into a municipal sewer system or one owned by an MUA, SA or regional utilities authority.

WASTE DISPOSAL (Question 13): This question asks you to describe how you dispose of wastes containing selected substances which are not emitted into the atmosphere or discharged into surface waters or sewerage systems.

QUESTION 13 - Disposal of Waste Containing the Selected Substance. This question is organized in tabular form. In the first column, list the name and location of each final disposal site to which you send waste containing the selected substance. This includes disposal facilities located on your own plant site, e.g., a chemical landfill or lagoon. In general, "final disposal site" means final with respect to you. If the operator of the disposal site makes further economic use of the waste (for example, he recovers solvents from it) you do not have to report this further use. (Note: do not list a transfer station as a final disposal site.)

In the second column, you are to characterize the physical state of the wastes you sent to the disposal sites listed in column one. Consult Table A and enter the appropriate physical state code or codes. If selected substance is contained in more than one type of waste, enter all appropriate code numbers.

For the third column, consult Table B and enter the appropriate code or codes. Your entries should reflect the disposal method employed at the site you listed in the corresponding row.

In the fourth column enter the quantity of selected substance contained in the waste disposed at the site you listed in the corresponding row. Once again, enter only the quantity of selected substance, not the total quantity of waste in which it is contained.

The fifth column is for DEP use only. Leave it blank.

APPENDIX C

PAPERS PRESENTED AT APCA MEETING

June 21-25, 1982
New Orleans, Louisiana

1. Development and Initiation of An Integrated State Monitoring Program for Toxic Air Pollutants. R. Harkov, New Jersey Department of Environmental Protection, R. Fischer.

2. Variations in Summertime Atmospheric Concentrations of Particulate Organic Matter at One Rural and Three Urban Sites in New Jersey. J. M. Daisey, New York University Medical Center, M. Morandi, and P. J. Lioy

3. Concentrations of Polycyclic Aromatic Hydrocarbons at Four Sites During an Extended Summer Sampling Campaign. A. Greenberg, New Jersey Institute of Technology, F. Darack.

4. Mutagenicity of Airborne Particles at Urban and Rural Sites in New Jersey. G. McGarrity, Institute for Medical Research, Camden, T. Atherholt, J. Louis and L. McGeorge.

5. Concentrations of Selected Organic Vapors in Ambient Air at Three New Jersey Urban Sites. B. B. Kebbekus, New Jersey Institute of Technology, J. M. Boxxelli.

6. Characterization of Interrelationships Between Particulate Organic Matter, Volatile Organic Compounds and Trace Elements. P. J. Lioy, New York University Medical Center, J. M. Daisey, N. M. Reiss and R. Harkov.

SECTION 6

AIR TOXICS CONTROL STRATEGIES:
CITY OF PHILADELPHIA

BACKGROUND INFORMATION

Initiation of Air Toxics Control

The impetus behind the formation of Philadelphia's air toxics program was the growing public concern over air contaminants in the City. Residents of the two major industrialized sections of the City were alarmed by the apparent high incidences of cancer in their neighborhoods. Many residents were also attributing a wide variety of health problems such as headaches, respiratory problems, and allergies to the presence of air contaminants. A coalition of environmental activist groups was formed to lobby City Council for passage of air toxics legialation.

On February 5, 1981, Bill 270, better known as the "right-to-know law," became a city ordinance. Bill 270 granted individuals living and working in the City free access to information concerning toxic air contaminants to which they may be exposed and the health effects associated with these substances. The Bill also mandates a program to evaluate and regulate emissions of toxic air contaminants to prevent such emissions from posing a health problem to the community. The Bill did not establish specific regulatory procedures, however. Instead, the Bill authorized the Air Pollution Control Board (APCB) to promulgate regulations to implement the provisions of the ordinance.

Enabling Legislation

Regulation VI of the Philadelphia Air Management Code, "Control of Emissions of Toxic Air Contaminants," embodies rules and regulations for implementing Philadelphia's air toxics program. Regulation VI establishes a list of toxic air contaminants to which the Regulation is applicable; prescribes notification requirements for emitters of listed toxic air contaminants; provides for public access to information concerning the emission of toxic air contaminants; and limits, controls or prohibits the emission of toxic air contaminants.[1] In other words, Regulation VI establishes the authority to: limit the emissions of toxic air contaminants by setting standards, control emissions by requiring methods of control, and prohibit emissions of certain substances entirely. The regulation became effective on August 7, 1981, six months after the passage of Bill 270.

Although this regulation was promulgated by the Air Pollution Control Board, it was developed and is being implemented by Air Management Services, a division of the Department of Public Health as instructed by Regulation VI. However, only the Air Pollution Control Board, an advisory group appointed by the Mayor of Philadelphia, has the authority to approve and promulgate regulations concerning air contaminants. It should be noted that the Department of Public Health, Air Management Services, and the Air Pollution Control Board were already in existence when Bill 270 and Regulation VI were promulgated. These pieces of legislation simply defined the roles and responsibilities of the existing governmental bodies in establishing and implementing a program to control the emissions of toxic air contaminants.

A list of 99 substances, selected by Air Management Services and approved by the Air Pollution Control Board, are regulated as "toxic air contaminants" under Regulation VI. Philadelphia's Air Management code (which includes Regulation VI) defines "toxic air contaminant" as:

> A chemical substance or material the discharge of which into the atmosphere, based upon relevant available scientific evidence establishing the toxic, mutagenic and/or carcinogenic effects of such substance or material, may pose a potential hazard to the community in terms of a significant increase in risk of acute or long-term health effects.

Regulation VI requires all sources emitting any of the 99 listed toxics to notify the Department of Public Health of the quantity and source of these emissions. Certain categories of sources are exempted from reporting. The emission notifications are filed at the Department of Public Health and are available for public review.

All sources subject to Regulation VI must obtain a permit to operate from the Department of Public Health. The Department has full permitting and enforcement authority. The Department of Public Health also has the authority to establish or approve procedures, guidelines, and methods to be used in the review and evaluation of toxic air contaminant emissions. As stated previously, Air Management Services (AMS) is the division of the Department of Public Health that has responsibility for developing and implementing the air toxics program under Regulation VI.

Other legislation worth mentioning, due to its potential impact on reducing the exposure of Philadelphia residents to toxic air contaminants, is Bill 475. Before the passage of Bill 475, the Fire Department had control of the use, storage, and transport of hazardous chemicals such as flammable liquids and solids, corrosive liquids, and oxidizing materials. Bill 475, which was passed simultaneously with Bill 270, amended Philadelphia's fire code giving the Fire Department control over the use, storage, and transport of toxic substances. Bill 475 defined "toxic substances" as:

> "Any substance that alone or in combination with another chemical or organic matter may pose a potential hazard to the community in terms of a significant increase in risk of acute or long-term health effects, based upon relevant available scientific evidence establishing the toxic, mutagenic, and/or carcinogenic effects of such substance."

The Fire Department, in defining toxic substances, adopted a list of over 400 substances considered toxic or hazardous by the Occupational Safety and Health Administration (OSHA) [Code of Federal Regulations, Subpart Z, July 1, 1980]. Facilities subject to the Fire Department's regulations for toxic substances must be licensed. Bill 475 also grants public access to records, reports, or information concerning the names and potential health effects of chemicals stored in industrial facilities in Philadelphia. The strict requirements for storage, use, and transport of toxic substances can effectively reduce the total emissions of toxic air contaminants by preventing release of fugitive emissions into the atmosphere and minimizing incidences of spills.

OVERVIEW OF THE REGULATORY PROGRAM

Scope

Philadelphia's air toxics program applies to the emissions of any of the 99 toxic substances listed in Regulation VI. Regulation VI applies to both new and existing sources. However, the Regulation specifically exempts the following source categories:

(1) Combustion processes using only commercial fuel, including internal combustion engines;

(2) Retail dry cleaning operations;

(3) Retail and non-commercial storage and handling of motor fuels;

(4) Incineration of waste materials other than liquid, semi-liquid or solid by-product industrial wastes; and

(5) Incidental or minor sources including laboratory-scale operations, fireplaces and household appliances, cooking appliances, general comfort ventilation of occupied spaces, housecleaning operations, residential-scale solvent use and pesticide application, and such other sources or categories of sources which are determined by the Department to be of minor significance for the purposes of this Regulation, or which the Department determines to be more appropriately evaluated by special survey methods.

Program Summary

Existing sources subject to Regulation VI were given 6 months (i.e. until February 7, 1982) to report information concerning the emissions of listed substances. Now that the reporting segment of the program has been completed, AMS has outlined the following procedure for implementing the remainder of its air toxics program.

First, information reported on the emission surveys will be verified by qualified engineering field investigators. This verification process is nearing completion. Meanwhile, the process of setting air quality guidelines is in progress. Air quality guidelines for each of the 99 listed toxics are being developed by AMS with the assistance of an ad hoc committee of experts. Available scientific literature is being evaluated during this development process. AMS expects to complete the guideline-setting process by the Fall of 1982.

When the verification and guideline-setting processes have been completed, AMS will begin screening those sources emitting any toxic air contaminants for potential health hazards. This process will involve ranking the reported emissions by relative toxicity and mass emission rates. Those sources with the highest toxic potential based on these factors will be investigated further. Detailed information on stack parameters and emission characteristics will be gathered, and dispersion modeling will be used to estimate maximum ambient concentrations beyond the property line for each source. The ambient concentration will be compared to the corresponding air quality guideline to determine whether or not the source poses a potential health hazard to the community. AMS will work closely with the affected facility to obtain the best possible emissions and ambient concentration estimates. Those sources which present potential health hazards to the community should be discovered during this intensive investigation.

The final step in the program is licensing. AMS has the authority to approve or deny annual operating licenses to any facility emitting toxic air contaminants. License approval will be granted only to those sources which, as determined by AMS, do not present a potential health hazard to the Community. For all other sources, the license may require controls or be denied in an effort to eliminate any potential health hazards. All new sources require an installation permit which is subject to AMS review and approval. The same procedures apply (i.e., estimating ground level concentration and comparing it to air quality guidelines).

This section provided a brief summary of Philadelphia's air toxics program. The following sections discuss several of the more complex components of the program in greater detail.

DETAILED DESCRIPTION OF PROGRAM COMPONENTS

Selection of 99 Toxic Substances

The list of 99 toxic substances regulated by AMS under Regulation VI is given in Table 6. This list was developed in a very short period of time following a brief literature search. References for the information used to develop this list are also given in Table 6. The following criteria were considered in selecting the 99 substances and substances which met one or more of these criteria were listed:

- risk of immediate acute or subacute harm to human health, at concentrations likely to be encountered in the community;
- proven carcinogenicity through epidemiological studies in both human and animal populations;
- suspected carcinogenicity as shown in human epidemiological studies or in laboratory studies of animals and other experimental media;
- mutagenicity and teratogenicity as proven through human, animal, and experimental media;

TABLE 6. PHILADELPHIA'S LIST OF TOXIC AIR CONTAMINANTS[1]

APPENDIX TO AIR MANAGEMENT REGULATION VI

Control of Emissions of Toxic Air Contaminants

The following substances and materials shall be considered toxic air contaminants for the purpose of this Regulation and shall be subject to the provisions and requirements set forth therein.

Schedule A (See Note)

1. Acrylonitrile (Ala, 3): Propenenitrile; Vinyl Cyanide
2. Aldrin (5,6)
3. 4-Aminodiphenyl (Alb): 4-Aminobiphenyl; P-Biphenylamine
4. 3-Amino-1, 2, 4-Triazole (A2): 5-(4-Acetaminodiphenyl)-3-Amino-5-Triazole Hydrate
5. Antimony and Compounds (A2)
6. Arsenic and Compounds (A2, 3)
7. Asbestos (Ala, 2, 3)
8. Benzene (A2, 3)
9. Benzidine (Alb, 3): 4,4'-Biphenyldiamine; 4,4'-Diphenylenediamine
10. Benzo (a) Pyrene (A2, 3): 3, 4-Benzophrene; BAP
11. Beryllium and Compounds (A2, 2, 3)
12. BHC (6): 1, 2, 3, 4, 5, 6-Hexachlorocyclohexane
13. Lindane & Isomers (6)
14. Bis (2-Chloroethyl) Ether (3, 5)
15. Bis (Chloromethyl Ether)(Ala, 3): Chloro(Chloroethoxy) Methane: BCME
16. Bis (2-Hydroxyethyl)-Dithiocarbamic Acid, Potassium salt (5)
17. Cadmium and Compounds (3)
18. Captan (5, 6)
19. Carbaryl (6)
20. Carbon Tetrachloride (A2, 3, 5): Tetrachloromethane
21. Chloramben (5, 6)
22. Chlordane (3, 4, 5, 6)
23. Chlorobenzilate (3, 5, 6)
24. Chloroform (A2, 3, 4, 5): Trichloromethane
25. Chloromethyl Methyl Ether (A2, 3): CMME
26. Chromium and Compounds (Hexavalent)(A2, 3)
27. DDT/DDD (3, 5, 6)
28. 1, 2-Dibromo-3-Chloropropane (3, 5, 6)
29. 3, 3'-Dichlorobenzidine (A2, 3): 3,3' Dichlorobiphenyl 4,4'-Diamine
30. 2,4-Dichlorophenoxy Acetic Acid (6): 2,4-D
31. Dieldrin (5, 6)
32. Di (2-Ethyl Hexyl Phthalate) (7)
33. Dimethylcarbamyl Chloride (A2, 3): Dimethylcarbamic Acid Chloride
34. 1,1-Dimethyl Hydrazine (A2, 3): Asymmetric Dimethyl Hydrazine

TABLE 6. (CONTINUED) PHILADELPHIA'S LIST OF TOXIC AIR CONTAMINANTS

35. Dimethyl Sulfate (A2, 3)
36. Dioxane (3): 1,4-Diethylene Dioxide; Glycole Ethylene Ether
37. Endosulfan (6)
38. Endrin (6)
39. Ethylenebisdithiocarbamic Acid Salts (5)
40. Ethylene Dibromide (A2, 3, 5): 1,2-Dibromoethane
41. Ethylene Dichloride (3): 1,2-Dichloroethane
42. Ethylene Oxide (3): 1,2-Epoxyethane
43. Ethylene Thiourea (3): 2-Imidazolidinethione; 1,3-Ethylene-2-Thiourea; ETU
44. Epichlorohydrin (3): 1-chloro-2,3-Epoxypropane
45. Formaldehyde (3)
46. Heptachlor (4, 5, 6)
47. Hexachlorobenzene (3, 4)
48. Hexachlorobutadiene (A2, 3, 4): Hexachloro-1,3-Butadiene
49. Hexamethyl Phosphoramide (A2): Tris (Dimethylamino) Phosphine Oxide
50. Hydrazine (A2, 3): Diamine
51. Kelthane (6)
52. Kepone (5, 6)
53. Lead and Compounds (7)
54. Manganese and Compounds (7)
55. Mercury and Compounds (2)
56. Methoxychlor (6)
57. Methyl Bromide (7)
58. Methyl Chloride (7)
59. 4,4'-Methylene Bis(2-Chloroaniline)(A2, 3): 3,3'-Dichloro-4,4'-Diaminodiphenyl-methane
60. Methylene Chloride (7): Dichloromethane
61. Methyl Iodide (A2, 3)
62. Mirex (5, 6)
63. Monomethyl Hydrazine (A2)
64. B-Naphthylamine (Alb, 3): 2-Aminonaphthalene
65. Nickel and Compounds (Ala, 3)
66. 4-Nitrodiphenyl (Alb)
67. Nitrofen (5)
68. 2-Nitropropane (A2, 5)
69. n-Nitrosodimethylamine (A2, 3)
70. Parathion (6)
71. Particulate Polycyclic Aromatic Hydrocarbons (Ala, 3); PPAH
72. Pentachlorophenol (4, 6)
73. Perchloroethylene (5): Tetrachloroethylene
74. Phenol (7)
75. n-Phenyl-BNaphthylamine (A2): n-Phenyl-2-Naphthylamine
76. Polybrominated Biphenyls (7): PBB
77. Polychlorinated Biphenyls (3, 4): PCB
78. Propane Sultone (A2, 3): 3-Hydroxy-1-Propanesulfonic Acid Sulfone
79. B-Propiolactone (A2): 3-Hydroxypropionic Acid Lactone
80. Propylene Imine (A2): 2-Methylaziridine

TABLE 6. (CONTINUED) PHILADELPHIA'S LIST OF TOXIC AIR CONTAMINANTS

81. Propylene Oxide (7): 1,2-Epoxypropane
82. Quintozene (6): Pentachloronitrobenzene; PCNB
83. Strobane (6): Terpene Polychlorinates
84. 2-(p-Tert-butylphenoxy)-Isopropyl-2-Chloroethyl Sulfite (5)
85. Tetrachlorinated Dibenzo-P-Dioxins (4): TCDD, Dioxin
86. Tetrachloroethane (3, 5): 1,1,2,2-Tetrachloroethane
87. Tetrachlorvinphos (5)
88. Thallium and Compounds (7)
89. O-Tolidine (A2, 3): 3,3'-Dimethylbenzidine; Diaminoditolyl
90. Trichloroethylene (3, 5): TCE
91. Trichlorophenol Isomers (3)
92. 2,4,5-Trichlorophenoxy Acetic Acid (6): 2,4,5-T
93. Trifluralin (5)
94. Toxaphene (4,6)
95. Vinyl Bromide (A2): Bromoethylene
96. Vinyl Chloride (Ala, 3): Chloroethylene
97. Vinyl Cyclohexene Dioxide (A2): 1,2-Epoxy-4-(Epoxy ethyl) Cyclohexane
98. Vinylidene Chloride (3, 4): 1,1-Dichloroethylene
99. Vinyl Trichloride (7): 1,1,2-Trichloroethane

Note: 'Reference Sources' in parentheses, followed by chemical synonyms.

The substances listed in Schedule B are criteria pollutants as defined by the Environmental Protection Agency. These are toxic air contaminants for which national ambient air quality standards are established by Federal law. The Air Management Code and Regulations adequately address reporting and control of these substances. Therefore, the pollutants listed in Schedule B are excluded from the reporting provisions of Air Management Regulation VI.

Schedule B

Carbon Monoxide
Sulfur Dioxide
Ozone
Nitrogen Dioxide
Total Suspended Particulates

'Schedule A' Reference Sources:

1. American Conference of Governmental Industrial Hygienists; Handbook Lists:

    A(1) (a). Human Carcinogens - recognized carcinogenic or cocarcinogenic potential with assigned Threshold Limit Value (TLV).

    A(1) (b). Human Carcinogens - recognized carcinogenic potential without an assigned TLV.

TABLE 6. (CONTINUED) PHILADELPHIA'S LIST OF TOXIC AIR CONTAMINANTS

A(2). Industrial Substances Suspect of Carcinogenic Potenial in Man - suspect of inducing cancer based on either (1) limited epidemiologic evidence, exclusive of clinical reports of single cases, or (2) demonstration of carcinogenesis in one or more animal species by appropriate methods.

2. National Emission Standards for Hazardous Air Pollutants (NESHAPS) - U. S. EPA.
3. TSCA Cancer Hazard Warning Label List - Toxic Substances Control Act - U. S. EPA.
4. List of Organic Chemicals of Widespread Concern - U. S. EPA.
5. Criteria for A Recommended Standard . . . Occupational Exposure During the Manufacture and Formulation of Pesticides - NIOSH.
6. Selected Substances Table I (Pesticides) - N. J. Department of Environmental Protection.
7. Special additions relative to local emission rates or concern.

- bioaccumulative effects in humans and the environment;
- findings of the Environmental Protection Agency, the Occupational Safety and Health Administration or other such agencies regarding toxicity;
- extent to which the substance is likely to be found in Philadelphia industries; and
- other such factors necessary for the proper regulation of toxic air contaminants.[1]

AMS excluded criteria pollutants and substances which were regulated locally as nuisances (due to odor, irritability, etc.) from its list.[a] The list does, however, include some substances which are subject to National Emission Standards for Hazardous Air Pollutants (NESHAP) or volatile organic compound (VOC) regulations.

Industrial Usage and Emission Surveys

Regulation VI required all existing sources emitting air toxics to report the quantity of emissions to AMS within six months of the effective date of the Regulation (August 7, 1981). AMS contacted approximately 700 companies by mail to explain the new law and to inform them of their obligations in relation to it. These companies were those on record as having criteria pollutants emissions greater than one ton per year. AMS thought that contacting criteria pollutant sources was a good means of identifying potential toxic emitters.

In addition to the explanatory cover letter, a survey form was enclosed requiring each company to list certain general information concerning toxic air emissions. In all cases, the form was to be returned to AMS even if none of the toxic substances was used or emitted. A copy of the explanatory letter and survey form are included in Appendix D of this report. Each company was also required to submit a Material Safety Data Sheet (U.S. Department of Labor Form OSHA 20) for each toxic air contaminant used or emitted. A sample of a Material Safety Data Sheet is also included in Appendix D.

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[a] The exception to this statement is lead, which although a criteria pollutant, is included on Philadelphia's list of toxic substances. AMS specifically included lead for two reasons: (1) AMS felt that lead had unique toxic effects that are different from other criteria pollutants, which warranted its inclusion, and; (2) there are only a few small sources of lead in Philadelphia and AMS felt these sources could be most effectively regulated under the air toxics program.

The response to the emission surveys indicated that 141 industrial facilities in Philadelphia emit one or more of the listed toxic air contaminants. These emissions surveys and Material Safety Data sheets are kept on file at AMS and are available for public inspection. Any information entitled to protection as trade secret will remain confidential, but all emissions data are available to the public by law.

Facilities report toxic air emissions only once unless emission rates change. A facility which anticipates changes in its emission rates due to modifications, increased capacity, etc., must receive approval from AMS before such a change can occur. New sources cannot emit any toxic air contaminants without prior approval of AMS. If future additions are made to the list of toxic air contaminants, any affected facility is required to file notice within 90 days of the effective date of the revision. If a facility encounters an emergency situation in which emissions are abnormally high, it must report the situation to AMS immediately and give written notice of the event within 24 hours. This requirement for emergency situations applies to the emissions of all air pollutants: criteria, non-criteria, and toxics.

Estimating Ambient Concentration

AMS evaluated various methods of estimating ambient concentrations and believes that dispersion modeling is more practical than monitoring. AMS is especially concerned with the ambient concentrations close to the property line because many residential areas are located at the boundaries of industrial facilities. Adding to this concern is the fact that the low-level stacks and fugitive emissions typical of Philadelphia industry potentially could result in high ambient concentrations in these residential areas.

AMS uses dispersion modeling techniques to estimate maximum emission concentrations beyond the property line on an annual average. The model used by AMS was developed in-house in cooperation with several industrial facilities in Philadelphia. This model was designed specifically for use in Philadelphia, accounting for the terrain and meteorological trends in the City. Input to the model includes emissions flow rate, stack height, stack diameter, temperature, and wind direction. Based on initial validation tests, AMS estimates that its dispersion model is accurate within a factor of two or three.

AMS decided not to use untested dispersion models because it feared that they may underestimate air quality close to the industrial facilities. Although standard dispersion models and Philadelphia's dispersion model are based on the same mass transfer principles, Philadelphia's dispersion model relies on more sensitive meteorological input. AMS was uncertain of the reliability of monitoring results in estimating ambient concentrations of toxic air contaminants from Philadelphia's industrial sources. The majority of the sources in Philadelphia emit less than one ton per year of toxics, and the ambient concentrations of these toxics could be less than the detection level of most ambient monitoring methods. AMS believes that, in dealing with such small quantities of emissions, it is easiest to measure or estimate the toxics concentration at the stack.

Development of Air Quality Guidelines

The development of ambient air quality guidelines (AQG) for each of the 99 listed toxic substances is probably the most difficult and time-consuming segment of Philadelphia's air toxics program. Under the authority of Regulation VI which states that "The Department of Public Health shall establish or approve procedures, guidelines and methods to be used in the review and evaluation of toxic air contaminants,"[1] the Health Commissioner appointed an ad hoc advisory committee. The function of this committee is to advise AMS by setting guidelines for each of the listed toxic air contaminants. The ad hoc committee provides the expert knowledge and judgement needed to assist AMS in making decisions about potential health effects of emissions of toxic air contaminants. Industry, academia, government, and the community are all represented on this committee of experts. The ad hoc committee consists of 10-11 members who are experts in the fields of toxicology, industrial hygiene, and occupational medicine. The committee is examining and debating available research material pertaining to the 99 toxic substances. The completed list of guidelines is expected to be released in the Fall of 1982.

At the onset of the guideline-development process, each member assumed responsibility for researching and evaluating available information on several substances. The members then reported their findings to the Committee, and recommended air quality guidelines for each substance. A few members chose not to participate in this research and evaluation process, opting instead to provide general balance and perspective to the group.

The Committee uses the following informal procedure in developing guidelines. Generally, if a National Ambient Air Quality Standard (NAAQS) has been established for a particular substance, it is adopted as Philadelphia's guideline. However, since very few NAAQS's have been established, it is usually necessary for the Committee to evaluate other data and information. Threshold Limit Values (TLV's) are typically used in developing guidelines when no NAAQS exists. TLV's have been established for the majority of the listed toxic substances. The Committee most often uses TLV's established by the American Conference of Governmental Industrial Hygienists (ACGIH) but TLV's established by the National

Institute of Occupational Safety and Health (NIOSH) and OSHA are also evaluated. Only TLV-Time Weighted Averages (TLV-TWA) are considered by the Committee. The TLV-TWA is defined as "the time-weighted average concentration for a normal 8-hour workday or 40-hour workweek, to which nearly all workers can be exposed, day after day, without adverse effect."[2] AMS is in the process of determining what safety factor should be incorporated into the TLV to account for continuous exposure as compared to worker exposure; additive effects; and effects on the general populations as compared to the healthy working sector.

In addition to TLV's, animal data and/or clinical studies may be used in establishing air quality guidelines. Safety factors which reflect the conditions and reliability of the tests are incorporated into the toxicity data, based on the best judgement of the committee.

Table 7 shows an example of one of the guidelines being developed by the Committee. When all 99 guidelines have been completed, they will be released and documented in the format shown. The documented guideline includes information such as uses, ambient levels in the United States, analytical methods, various TLV's, physiological responses, and references used in developing guidelines.

Use of Guidelines

Philadelphia's air quality guidelines are not standards. The Air Management services staff felt that it was important to establish guidelines rather than standards to allow flexibility in negotiation and to account for the uncertainties which exist in any air toxics program. For example, if a company feels that a specific guideline is unreasonable and can support this claim, the company can appeal to AMS to review the guideline. AMS has the authority to change a particular guideline if it feels such action is necessary, in which case the change would apply to all sources emitting the substance to which the guideline applies.

TABLE 7. SAMPLE AIR QUALITY GUIDELINE[a]

Trichloroethylene

Guideline: 120 ppb

CCl_2: CHCl

Molecular Weight: 131.4

Uses: Degreaser solvent, dry cleaning solvent, refrigerant, fumigant

Ambient Levels:

Oakland:	Average - 188 ppt,
Somerset County, NJ	Average - 200 ppt, peak - 1 ppb
Piscataway/Middlesex, NJ:	Average - 230 ppt, peak - 0.89 ppb
Bridgewater Township, NJ:	Average - 350 ppt, peak - 2.7 ppb
Los Angeles:	Average - 399 ppt, peak - 3.1 ppb
Phoenix:	Average - 484 ppt
Houston:	Average - 584 ppt, peak - 1.2 ppb
Rutherford, NJ:	Average - 760 ppt, peak - 9.3 ppb
Newark, NJ:	Average - 1800 ppt, peak - 87 ppb

Analytical Methods:

Threshold Limit Value:
ACGIH - 50 ppm 8 hr TWA; STEL - 150 ppm[b]
OSHA - 100 ppm TWA
NIOSH - 25 ppm

Basis for TLV: ACGIH recommends a threshold limit value of 5 ppm to provide workers with adequate protection against the toxic effects of trichloroethylene.

Physiological Responses : Trichloroethylene affects the central nervous system (euphoria, analgesia, anesthesia); the liver (necrosis, hepatomas); the kidney (necrosis); the lungs (tachypnea); heart (arrhythmias); skin (irritation, vesication, paralysis of the fingers immersed in liquid (TCE); and bone marrow (myelotoxic anemia).

An epidemiologic study of 7688 workers in Scandinavian countries showed no significant increase in cancer mortality.

Trichloroethylene has caused liver cancer in mice but not in rats. It is a weak mutagen in three test systems: microbial, yeast, and Tradescantia. Trichloroethylene has also caused malignant transformation of rat embryo cells.

TABLE 7. (CONTINUED) SAMPLE AIR QUALITY GUIDELINE[a]

Basis for Guideline: TLV/420

References

Axelson, O., Anderson, K., Hogstedt, C. et. al: J. Occup. Med. 20:194 (1978).

National Cancer Institute: Carcionogenic Bioassay of Trichloroethylene, Cas No. 79-02-6, National Center Inst. Tech. Rept. Series No.2 (Feb. 1976), U.S. Dept. of Health, Ed. & Welfare, DHEW Publ. No. (NIH) 76-802, Washington, D.C.

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[a] This is an example of the documentation of the guidelines being developed by Air Management Services. This guideline is not yet official and the value for the guideline, 120 ppb is subject to change before the guideline becomes official.

[b] STEL - (Short Term Exposure Limit) The TLV-STEL is the maximal concentration to which workers can be exposed for a period up to 15 minutes (continuously without suffering from (1) irritation, (2) chronic or irreversible tissue change, or (3) narcosis of sufficient degree to increase acident proneness, impair self-rescue, or materially reduce work efficiency, provided that no more than four excursions per day are permitted, with at least 60 minutes between exposure periods, and provided that the daily TLV-TWA also is not exceeded.[2]

In general, if a particular source has emissions which result in ambient concentrations significantly greater than the air quality guidelines, AMS has reason to believe that there is a problem which should be addressed immediately. On the other hand, if the ambient concentration from a source is significantly less than the air quality guideline, AMS believes it is unlikely that the source poses a health hazard to the community.

However, AMS sees some difficulty in determining whether a source whose emissions result in ambient concentrations close to the guideline represents a potential health hazard. For sources that fall into this category, AMS will investigate further. At this point, AMS will work closely with the affected facilities to better approximate emissions and their effects on air quality and health. Stack testing and ambient monitoring may be required during this investigation to verify emission rates and ambient levels previously estimated by dispersion modeling.

AMS has established an internal prioritization system for conducting these more thorough investigations. The list of 99 toxic substances has been divided into three categories — most toxic, moderately toxic, and least toxic — based on AMS's best judgement. "Most toxic" includes known carcinogens and "least toxic" includes many substances about which there is some doubt concerning their toxicity. Those facilities emitting any amount of a "most toxic" substance will be investigated first. Then those facilities emitting greater than 250 lbs/year of a "moderately toxic" substance will be investigated, followed by an investigation of those facilities emitting greater than 2500 lbs/year of a "least toxic" substance. Any facility which does not fall into any of the above categories will be investigated last. It should be noted that the cut-off levels were chosen arbitrarily and that their sole purpose is to give AMS direction in conducting its intensive investigations.

Licensing and Enforcement

Licensing for sources emitting toxics will not begin until all air quality guidelines have been established. All sources in Philadelphia emitting criteria pollutants must renew their operating licenses annually. Under Regulation VI, these operating licenses will be expanded to include both criteria pollutants and toxic air contaminants, with yearly renewals required.

Regulation VI gives AMS the full permitting and licensing authority for facilities emitting toxic air contaminants. Regulation VI states that this approval will be granted only upon a determination by AMS that such emission or discharge will not pose a health hazard. The following decisions may be reached by AMS concerning any permit or license submitted:

(1) approval as submitted,

(2) conditional approval subject to an immediate emission reduction to a predetermined level,

(3) conditional approval subject to compliance with the approved improvement plan and schedule to effect a predetermined emission reduction within a period not to exceed two years, or

(4) disapproval.

AMS feels that having two types of conditional approval allows it to distinguish between those emission sources which are "blatantly excessive" and require immediate control and those sources for which additional control is needed but not urgently. Philadelphia's air toxics program is aimed at eliminating any health hazards which may exist in the City. Furthermore, AMS has the authority to require any means of control to achieve this objective even if it means closing a facility. However, AMS does not anticipate having to take such drastic action.

Air Management Services has stated that Philadelphia has good industry compliance. Because AMS has a relatively large staff for a small area (compared to most agencies), it is very aware of industry activity. Active community participation also helps keep compliance levels high. In other words, no corporation operating within the city wants to be viewed as "a bad guy."

ADMINISTRATIVE ISSUES

Operation of Program to Date and Future Milestones

The implementation of Philadelphia's air toxics program is progressing smoothly with good industry cooperation. Response to the emissions survey has been one-hundred percent even though some facilities failed to meet the reporting deadline of February 7, 1982. A total of 706 facilities have reported although a small percentage of these reports were incomplete (lacking a signature, missing a number, etc.).

Of the 706 facilities that reported, 141 reported emissions of one or more toxic air contaminants, but the majority of these reports indicated emissions of less than 1 ton/year. These estimates indicated emissions of various toxic air contaminants from different process operations that might include more than one stack or source. Twenty-three facilities reported emissions of a particular toxic substance ranging from 1-5 tons/year; eight reported emissions of 5-20 tons/year; two reported emissions of 20-50 tons/year; and two reported emissions exceeding 50 tons/year. The largest reported emission rate from a single facility was 108 tons/year of perchloroethylene, due to evaporation from dry cleaning and clothes handling operations.

As of June 15, 1982, 538 of the reports had been investigated and 358 had been verified. The investigations indicated that about 10 to 20 percent of the facilities reporting no toxics emissions actually do emit toxics. However, this 10 to 20 percent consisted mostly of small companies with limited chemical capabilities which were unaware of the problem. An example cited by AMS was one of a small company using a trade name adhesive, unaware that it contained formaldehyde. AMS stated that no action was taken against those facilities which did not report any toxic emissions but which actually were emitting toxics. AMS felt that personnel at those facilities were honestly unaware that the facilities were emitting anything. AMS simply informed the facilities of the problem and corrected the reporting mistake. However, AMS stated that had it felt the mistakes were intentional, it might have taken action to penalize the facilities. AMS also cited other facilities that reported "everything but the kitchen sink" just to cover themselves.

As stated previously, Air Management Services and the ad hoc committee of experts are nearing the completion of their guideline-setting process. When the guidelines are finalized, AMS will begin comparing ambient concentrations to air quality guidelines. AMS expects the vast majority of the sources to have ambient concentrations significantly lower than the guidelines and expects no more than five facilities to be greatly exceeding the guidelines. AMS personnel also anticipate that fewer than 50 facilities will require further evaluation. The entire evaluation process is expected to be completed by the end of 1984.

AMS does not expect many new sources to come on-line during the next few years because the number of industrial facilities in Philadelphia has dropped tremendously over the past two decades. In the 1960's there were over 3500 industrial facilities in Philadelphia; today there are only about 700. If current trends continue, AMS does not expect to be evaluating and permitting large numbers of new sources and new sources should not cause delays in their program schedule.

Under the "right to know" provisions of Philadelphia's air toxics program, AMS has received and responded to 15 requests for information to date. AMS' plans for the future include plans to conduct area-wide monitoring for selected toxic air contaminants, in conjunction with

EPA's National Monitoring Center to be located in Philadelphia. The monitoring results obtained may be used to review and revise the existing toxics list and guidelines. Air Management Services is considering addressing the problems of peak emission periods and additive effects of exposure to several toxic air contaminants.

Emergency Response

Philadelphia does not currently have any standard approach for dealing with emergency situations involving toxic air contaminants. AMS feels that the best emergency response approach is having knowledgeable personnel available who are aware of the substances used at the facilities in the city and who can work efficiently with those in charge of a facility in an emergency situation. AMS does not have the authority to evacuate an area during an emergency. The ultimate authority to evacuate resides with the City Managing Director or, in his absence, with the Senior Fire Department official at the scene.

Level of Effort Required

Prior to the passage of the Bill 270, AMS had conceived and developed a plan for establishing a toxics investigative capability, and applied for federal funding to implement this plan. EPA Region III approved a special Section 105 grant for this purpose in July, 1980 and has provided almost $500,000 to AMS thus far. This money was used to purchase a gas chromatograph/mass spectrometer (GC/MS) and to hire several new engineers and chemists.

Air Management Services has 10 to 15 people involved in the air toxics program, most of whom are engineers. AMS estimates that approximately 10 man-years per year will be needed for the next four years. Beyond that time, they find it difficult to estimate what capabilities will be needed.

Philadelphia's Evaluation of the Program

The Air Management Services staff expressed its concern about the applicability of TLV's in developing air quality guidelines. ACGIH has stated that its TLV's

> " . . . are not intended for use, or for modification for use, (1) as a relative index of hazard or toxicity, (2) in the evaluation or control of community air pollution nuisances, (3) in estimating the toxic potential of continuous, uninterrupted exposures or other extended work periods . . ."[2]

After evaluating other methods for determining air quality guidelines, however, AMS maintains that TLV's represent the most reliable information concerning exposure to toxic substances.

AMS feels that the use of an ad hoc committee in setting guidelines permits experts from industry, academia, government and the community to have a voice in setting air toxics policy. Whereas, if AMS were to set the guidelines without the assistance of the committee, the guidelines might not be as well received by industry and the community. However, one problem that AMS has encountered in having an ad hoc committee is that it is often difficult for the committee to reach agreement on a particular guideline or procedure. AMS feels that it is very important that all members of the committee be willing to work toward acceptable solutions.

AMS maintains that its air toxics approach is the best method of addressing public concern about toxic air contaminants. In their opinion, requiring a specific degree or means of control does not address public concern because the public will question whether the "best technology" is good enough to assure that there is no health hazard. Moreover, AMS does not believe that formalized risk assessment should be used in air toxics programs because the public may question the concept of "acceptable" risk.

AMS repeatedly stressed the importance of using guidelines rather than standards, because guidelines permit flexibility in negotiation. AMS also believes that guidelines will be better received than any type of standard requirement such as an emission limit, emission control, or "acceptable" risk. AMS also feels that although industry and the public may challenge specific guidelines, they will not challenge the program as a whole. AMS believes that air toxics programs can work only if industry, government and citizen groups are all willing to work together to reach a satisfactory solution.

The Air Management Services staff stated that there were good and bad aspects to the right-to-know law. AMS feels that the right-to-know law makes it easier to gather information from industry, and that it is good politically and psychologically for the community. However, AMS maintains that it would have been less expensive and less difficult to make thorough investigations of the trouble spots instead of inventorying every facility in the city. AMS said that it was aware of most of the trouble spots within the City and has not accomplished much by inventorying all the very small facilities. In other words, the right-to-know law and the air toxics program have not uncovered many surprises for AMS.

AMS thinks that the biggest problem facing its air toxics program is inherent uncertainties about emissions estimates, toxicity data, monitoring methods, and what constitutes a health hazard. AMS views its air toxics program as being based almost entirely on refutable assumptions. However, because of public and political pressure forcing rapid development of the air toxics program, AMS had no alternative but to use its best judgement in making programmatic and policy-related decisions.

The Air Management Services staff had the following advice for other agencies trying to initiate air toxic programs. AMS thinks it very important to have industry and community involvement in the program. AMS thinks that having a list of toxic substances lends direction to the program and makes it more manageable. Moreover, the list can be revised periodically as the need arises so that flexibility to respond to new toxicity information is not lost. AMS also recommends the use of air quality guidelines. Overall, AMS stresses the importance of having an open-ended program which encourages cooperation and exchange of information between industry and the community.

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REFERENCES

1. Philadelphia Department of Public Health, Air Pollution Control Board. Air Management Regulation VI "Control of Emissions of Toxic Air Contaminants" of Title 3, Air Management Code. Philadelphia, Pennsylvania. August 7, 1981.

2. American Conference of Governmental Industrial Hygienists (ACGIH). Threshold Limit Values (TLV's) for Chemical Substances in Workroom Air. Cincinnati, Ohio. 1980. pp. 2-4.

APPENDIX D

CITY OF PHILADELPHIA

DEPARTMENT OF PUBLIC HEALTH
STUART H. SHAPIRO, M.D., M.P.H.
Health Commissioner

AIR MANAGEMENT SERVICES
801 Arch Street — 6th Floor
Philadelphia, Pa. 19107

WILLIAM REILLY
Assistant
Health Commissioner
for Air Management Services

On February 5, 1981, the Mayor signed into law City Council Bill No. 270 (Right to Know), amending the Air Management Code, which is intended to provide individuals who live or work in the city with information about the toxic air contaminants to which they may be exposed and the health effects associated with these substances, and to empower the Air Pollution Control Board to promulgate regulations to implement the provisions of the ordinance.

On June 9, 1981, the Air Pollution Control Board adopted Air Management Regulation VI, Control of Emissions of Toxic Air Contaminants, which became effective on August 7, 1981. (Copy enclosed).

Pursuant to the provisions of the Air Management Code, as amended, and Regulation VI, Section II(A), any person who discharges, from any facility, any toxic air contaminant listed in the Appendix to Regulation VI must file written notice with the Department within six (6) months from the effective date of the Regulation. A Material Safety Data Sheet must also be provided to the Department for each toxic air contaminant listed in the notice.

Based on information in the Department's emission inventory source files, your facility has been identified as a possible emitter of one or more toxic air contaminants listed in Regulation VI, Appendix A. Accordingly, you are requested to complete the enclosed form, entitled "Notice of Toxic Air Contaminant Emissions," and to return it in the enclosed envelope to the Department prior to February 7, 1982, along with a Material Safety Data Sheet for each substance that you have listed on the notice form. A supplemental instruction sheet is enclosed to assist you in completing the form.

Reproduced from best available copy.

If your facility does not emit a substance listed in the Appendix to Regulation VI, or the emission is exempted under the provisions of Section II(C), please insert "not applicable" of "N.A." in the first space and sign and return the form. Due to the large number of facilities included in this mailing and the time constraint imposed by City Ordinance, your cooperation and prompt attention is requested in this matter. The enclosed form should be completed and returned as soon as possible, and in no event later than February 7, 1982, so as to avoid a possible non-compliance penalty.

Any questions pertaining to this mailing should be directed to the attention of the Toxic Air Pollutant Study by telephoning MU6-7894, or in writing to:

Philadelphia Department of Public Health
Air Management Services (TAPS)
801 Arch Street
Philadelphia, PA 19107

Information submitted on the notice form will be subject to verification by the Department and a File of Notices will be maintained and made available by the Department for public inspection during normal business hours. If additional information is required pertaining to emissions from your facility. you will be so notified by the Department.

Enclosures:

1. AMS Regulation VI
2. Notice of Toxic Air Contaminant Emissions (Form 55-AM-232)
3. Instructions for Completing Form 55-AM-232

CITY OF PHILADELPHIA
AIR MANAGEMENT SERVICES

INSTRUCTIONS FOR COMPLETING FORM 55-AM-2321

NOTICE OF TOXIC AIR CONTAMINANT EMISSIONS

TYPE OR PRINT IN APPROPRIATE SPACE:

NAME OF COMPANY: Self-explanatory

ADDRESS OF COMPANY: Self-explanatory

SOURCE ADDRESS: Give the street address of the location of the source of emission.

NAME OF TOXIC AIR CONTAMINANT: Enter the principal name of the substance(s) as listed in Schedule A of Regulation VI. If there are no emissions of any Schedule A toxic air contaminant from the source address, or if the emission is specifically exempted under Section 11 C of Regulation VI, enter "not applicable" or N.A.

DESCRIPTION OF EMISSION SOURCE(S): For each listed toxic air contaminant enter the area(s), and/or operation(s) causing the emission, e.g., Building No. 101, Maleic Anhydride Production, Reactor, Storage tanks, Fugitive emissions, etc.

ESTIMATED MAXIMUM EMISSION RATES: Enter the total of all sources for each contaminant listed. The maximum rates must be estimated for each time period, i.e., hour, day, year and should include "accidental" or "unusual" emissions that have occurred more frequently than once per year. Material throughputs and production schedules should be estimated at the highest rates that have occurred or may reasonably be expected to occur for each respective time period. Emission factors, material balances, stack tests, and similar methods may be used to estimate the maximum emission rates. The basis for estimation should be stated under Additional Comments.

DATE EMISSION BEGAN: Enter the earliest date of emission, month and year.

ADDITIONAL COMMENTS: Use this space or attach additional sheets to explain the methods used for estimating maximum emission rates, any variation of emissions since start-up, any scheduled changes, or any other conditions which might be necessary to understand the extent and duration of the emission(s).

COMPANY OFFICIAL COMPLETING THIS REPORT: Someone in a "responsible" position must complete and sign the form. This can be an officer of the company, the plant manager, the manager of environmental affairs for the company, or someone with similar authority. All forms must be signed and dated including those marked "not applicable" or N.A.

NOTICE OF TOXIC AIR CONTAMINANT EMISSIONS

CITY OF PHILADELPHIA
DEPARTMENT OF PUBLIC HEALTH
AIR MANAGEMENT SERVICES

E OF COMPANY

RESS OF COMPANY

RCE ADDRESS

NAME OF TOXIC AIR CONTAMINANT *(From Schedule A)*	DESCRIPTION OF EMISSION SOURCE(S)	ESTIMATED MAXIMUM EMISSION RATES			DATE EMISSION BEGAN
		LBS/HR.	LBS/DAY	LBS/YR.	

DITIONAL COMMENTS

COMPANY OFFICIAL COMPLETING THIS REPORT:	NAME	DATE
	TITLE	
	SIGNATURE	

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing,
Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
ADDRESS *(Number, Street, City, State, and ZIP Code)*	
CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
CHEMICAL FAMILY	FORMULA

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)		SPECIFIC GRAVITY (H_2O=1)	
VAPOR PRESSURE (mm Hg.)		PERCENT, VOLATILE BY VOLUME (%)	
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (________ =1)	
SOLUBILITY IN WATER			
APPEARANCE AND ODOR			

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
EXTINGUISHING MEDIA			
SPECIAL FIRE FIGHTING PROCEDURES			
UNUSUAL FIRE AND EXPLOSION HAZARDS			

PAGE (1)

(Continued on reverse side)

Form OSHA-20
Rev. May 72

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

EFFECTS OF OVEREXPOSURE

EMERGENCY AND FIRST AID PROCEDURES

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE		

INCOMPATABILITY *(Materials to avoid)*

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR		

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

WASTE DISPOSAL METHOD

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*

VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)*	OTHER

PROTECTIVE GLOVES	EYE PROTECTION

OTHER PROTECTIVE EQUIPMENT

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

OTHER PRECAUTIONS

SECTION 7

AIR TOXICS CONTROL STRATEGIES:
STATE OF NEW YORK

BACKGROUND INFORMATION

Initiation of Air Toxics Control

New York's Division of Air has regulatory responsibility for about 30,000 process emission points, and approximately 80 percent of these emit toxic contaminants.(1) The large number of sources of toxic air contaminants and the variety of contaminants in the emissions are the main factors which have led to the present air toxics control program in New York. State officials noted that this situation created the need for a reproducible and consistent method of processing the large number of permits involving emissions not covered by Federal or State standards. New York has had the authority to regulate air toxics since 1966 and the present system has evolved over time accompanied by increased public and State awareness of toxic emissions.

Enabling Legislation

The New York Environmental Conservation Law gives the Department of Environmental Conservation (DEC), the authority to develop policies, standards, codes, rules and regulations to prevent and abate air pollution. This authority is exercised through the Commissioner of Environmental Conservation, head of the DEC and an appointee of the Governor. The Commissioner is also given enforcement authority.(2)

Article 19 of the Environmental Conservation Law is known as the Air Pollution Control Act. This Article gives broad definitions to the terms "air contaminant" and "air pollution." "Air contaminant" is defined as ". . . a dust, fume, gas, mist, odor, smoke, vapor, pollen, noise or any combination thereof." "Air pollution" is defined as

> ". . . the presence in the outdoor atmosphere of one or more air contaminants in quantities, of characteristics and of a duration which are injurious to human, plant or animal life or to property or which unreasonably interfere with the comfortable enjoyment of life and property . . ."(2)

The law does not include any specific references to toxic air contaminants and deliberately omits usage of the term "air pollutant."

Pursuant to the authority granted by the legislation, the Commissioner has promulgated several rules and regulations, three of which are involved in air toxics control. The first is a definition of terms and includes the same general definition of "air contaminant" and "air pollution" as the Air Pollution Control Act.(3) The second applicable rule requires that each air contaminant source obtain a permit to construct (PC) and a certificate to operate (CO) before beginning construction or operation, respectively.(4) PC's are valid for up to 1 year and may be renewed for periods (not to exceed one year) unless revoked. CO's are valid for up to 5 years and must be renewed before expiration. The third rule (Part 212) applies to processes processes and exhaust and/or ventilation systems where there is no other State or Federal rule covering a specific source category or type of air contaminant.(5) It requires that each air contaminant from each emission source be assigned one of four possible environmental ratings. Evaluation of toxic properties of the emissions is the first item to be considered in determining the appropriate environmental rating for the emission sources. It also specifies the degree of air cleaning required based on the environmental rating and the emission rate potential.

The State's Uniform Procedures Act also affects control of air toxics. It mandates timely review of permit applications, requiring that a permit application be reviewed for completeness within 15 days after it is submitted. The entire permit review must be completed in 45 to 90 days.

State Organization for Regulating Air Toxics

The responsibility for regulating toxic air emissions lies with the Division of Air within the New York State Department of Environmental Conservation (DEC). DEC handles toxics control by media.

The organization chart in Figure 4 outlines the structure of the Division of Air. The following seven sections, highlighted in Figure 4, are involved in regulating air toxics:

1. Toxics and Radiation Section - This section was instrumental in developing New York's regulatory program for toxic air emissions. The Toxics and Radiation section handles unusual or difficult permitting issues referred to the Division of Air by the regional offices.

2. Regional Offices - New York's permitting program is decentralized into nine regions with the authority to review and issue permits. (This authority has been further delegated to some counties.)

3. Source Review and Regional Support Section - This section oversees the Air Pollution Source Management System, a computerized emissions inventory data base.

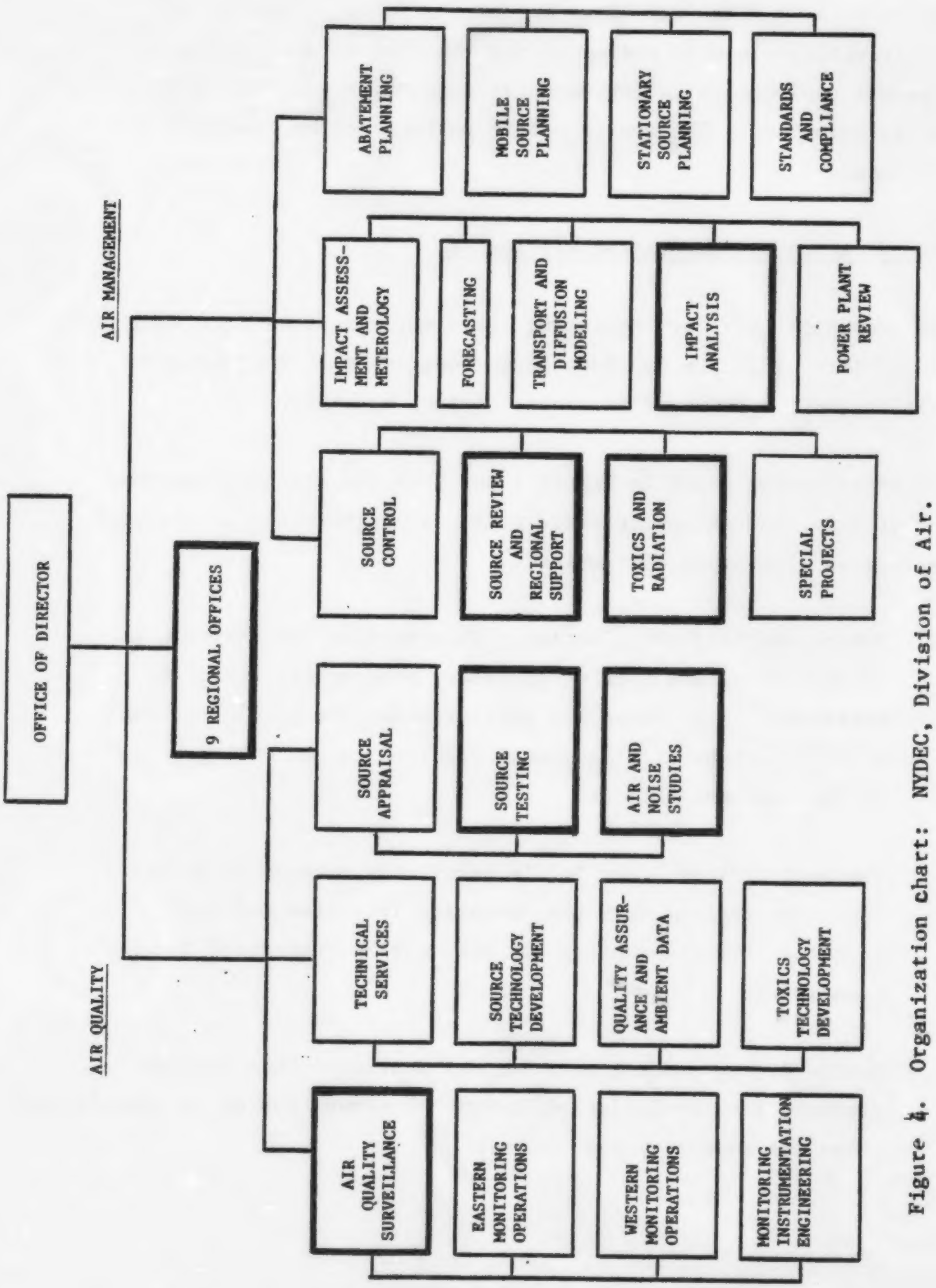
OFFICE OF DIRECTOR
9 REGIONAL OFFICES
AIR QUALITY
AIR MANAGEMENT
AIR QUALITY SURVEILLANCE
EASTERN MONITORING OPERATIONS
WESTERN MONITORING OPERATIONS
MONITORING INSTRUMENTATION ENGINEERING
TECHNICAL SERVICES
SOURCE TECHNOLOGY DEVELOPMENT
QUALITY ASSURANCE AND AMBIENT DATA
TOXICS TECHNOLOGY DEVELOPMENT
SOURCE APPRAISAL
SOURCE TESTING
AIR AND NOISE STUDIES
SOURCE CONTROL
SOURCE REVIEW AND REGIONAL SUPPORT
TOXICS AND RADIATION
SPECIAL PROJECTS
IMPACT ASSESSMENT AND METEROLOGY
FORECASTING
TRANSPORT AND DIFFUSION MODELING
IMPACT ANALYSIS
POWER PLANT REVIEW
ABATEMENT PLANNING
MOBILE SOURCE PLANNING
STATIONARY SOURCE PLANNING
STANDARDS AND COMPLIANCE

Figure 4. Organization chart: NYDEC, Division of Air.

4. Air and Noise Studies Section - This section conducts site specific ambient air monitoring studies at the request of regional offices, other program units, or local air pollution control agencies.

5. Source Testing Section - This section conducts, witnesses, and reviews test protocol for stack testing. It also directs the field staff in fuel sampling of burnable chemical wastes to ensure that contaminants in the fuel are not emitted in quantities which could cause excessive health risks to the receptor population.

6. Air Quality Surveillance Section - This section conducts ambient air monitoring for certain toxics to determine background concentrations.

7. Impact Analysis Section - This section provides guidance to the Regions on topics such as a method for quickly estimating the ground level concentration based on stack emissions and meteorological data.

The New York State Department of Health (DOH) assists DEC in air toxics control by providing health-related information and performing necessary laboratory analysis. DOH reviewed and contributed to the development of the air toxics control guidelines. The department establishes acceptable ambient levels for certain compounds at the request of DEC. It also reviews the acceptable ambient levels established by DEC. All laboratory work for the Division of Air is done in DOH labs.

The Division of Air staff stressed the importance of interagency and intraagency cooperation to the success of the air toxics control program. They noted that the pervasive nature of toxic contaminants makes an integrated regulatory approach to toxics very important.

OVERVIEW OF REGULATORY PROGRAM: AIR GUIDE - 1

Function

Concern over regulating toxic air emissions and the authority to do so have existed since 1966 in New York. The most recent guidance on air toxics control, Air Guide-1, was developed by the Toxics and Radiation Section as a means of implementing Part 212, the administrative rule requiring DEC to consider the toxic properties of emissions. Air Guide-1 was completed in December 1981. Air Guide-1 presents a system for evaluating permit applications that involve toxic emissions from process sources. It presents numerical guidelines for acceptable ambient levels that the nine regional offices and local agencies use to determine whether a permit should be granted.

Scope

The primary purpose of Air Guide-1 is to provide guidelines for Regional Engineers issuing permits for sources that emit toxic air contaminants not already covered by certain Federal or State ambient air quality standards. To this end, it lists the existing Federal and/or State ambient air quality standards for sulfur dioxide, carbon monoxide, ozone, beryllium, nitrogen dioxide, lead, fluorides, and hydrogen sulfide.(6) It also lists acceptable ambient levels for specific contaminants and the method for determining the acceptable ambient level for any other toxic air contaminants. Regional engineers treat all emissions as toxic unless the substance is obviously not toxic. Questions on possible toxicity are referred to the toxicologist in the Toxics and Radiation Section. In other words, Air Guide-1 can be considered a generic approach because it covers any toxic air contaminant. Any process, exhaust, and/or ventilating system regardless of size or quantity of emissions subject to Part 212 is also subject to guidelines in Air Guide-1.

Any new emission source or modified existing source must obtain a permit to construct and a certificate to operate in New York. There is no minimum emission cutoff below which a source would be exempt from these requirements. Permits to construct are valid for 1 year but may be renewed for periods of 1 year unless revoked. Owners of existing sources must renew certificates to operate every 1 to 5 years depending on the terms specified in the certificates.

Summary of Air Guide-1 Process

For summary purposes, the permit review process explained in Air Guide-1 can be divided into four steps. This section will briefly outline the steps and following sections will explain each part in more detail. First, the applicant must list all emissions regardless of toxicity, emission rates in pounds per hour and tons per year, stack parameters, and the Chemical Abstract Services (CAS) registry number for identifying the substances emitted. All of the emission data submitted with the permit application are stored in the computerized Air Pollution Source Management System. This system is described in more detail in a subsequent section.

In the second step, the regional air pollution control engineer (RAPCE) verifies the information in the application at the site and determines the toxicity category and corresponding acceptable ambient level (AAL) for the air contaminant emitted according to Air Guide-1. Air Guide-1 classifies 215 contaminants into high, moderate, or low toxicity classes. For 13 of these contaminants, DOH has determined an AAL. For the others, the guidelines give an appropriate factor for each of the three toxicity classifications. To determine the acceptable ambient levels, these factors are applied to the time weighted average-threshold limit values (TWA-TLV) developed by the American Conference of Government Industrial Hygienists (ACGIH). Any contaminant that has a TLV, but is not one of the 215 listed is assumed to be in the moderately toxic classification. If a substance has no TLV, DEC would determine the AAL with review by DOH.

In the third step of this process, the RAPCE compares the AAL to the applicant's estimated contribution to the ambient level at the maximum off-site receptor. This comparison is first done quickly by dividing the source's in-stack concentration (ppm) by 10. If the quotient does not exceed the AAL, the permit would be granted and no further analysis required. If further analysis were necessary, the RAPCE would estimate the ambient concentration expected from the source by determining the worst case 90-day impact and dividing by 2 to get the annual average concentration. This estimate would be done at the Regional office using stack parameters provided in the application. If the ambient concentration resulting from the source's emissions exceeds the AAL, then more refined, site-specific modeling would be done with detailed meteorological data. This refined modeling would be done by the source owner or the Region, depending on the resources available and would include all sources of the contaminant at that facility. In cases where valid and adequate ambient air monitoring data are available, they would be used instead of modeling estimates.

The fourth step in the process is to grant or deny the permit. If the emissions from the source will not exceed the AAL, then the permit would be granted, specifying the permissable emission rate in pounds per hour and tons per year, based on the AAL and the stack parameters. The permit also specifies requirements such as stack testing, operational limitations, control devices, and source monitoring requirements. If emissions from the source exceed the AAL, the RAPCE refers the application to the Toxics and Radiation Section in the DEC. In special cases or at the applicant's request, DEC and DOH then meet with the applicant for an in-depth technical review of the toxicity data, the modeling results, control measures, and the possibility of doing ambient air monitoring to verify the modeling results. Such a review might lead DEC and DOH to conclude that the AAL was either too stringent or too lax or to suggest that the applicant use an alternative control measure. DEC, DOH, and the applicant would try to develop a plan acceptable to all parties so that the permit could be granted, but if this could not be done, DEC would deny the permit.

AIR GUIDE-1 IMPLEMENTATION

The following sections explain in more detail determination of the AAL, inventory data collection, estimation of the source's emissions, control requirements, compliance and noncompliance with permit conditions, and the toxics monitoring program.

Determination of the Acceptable Ambient Level

Development of Air Guide-1 List--

As mentioned in a previous section, Air Guide-1 lists 215 substances placing 43 in the high, 141 in the moderate, and 31 in the low toxicity classifications. This list of 215 substances was developed by the toxicologist in the Toxics and Radiation Section with review by DOH. It was compiled using literature on toxicological properties and lists developed by Federal agencies such as the Environmental Protection Agency and the Occupational Safety and Health Administration; states; foreign countries including Norway, Germany, and the USSR; and organizations such as the Air Pollution Control Association and ACGIH.

The high toxicity group is defined as demonstrated human carcinogens, potential human carcinogens or other substances posing a significant risk. A potential human carcinogen would be a chemical for which the one in 1,000,000 lifetime carcinogenic risk (as calculated using a multistage model) corresponds to a daily dose of 0.12 g or less. For such chemicals, the required experimental evidence would be carcinogenicity in two animal species, one animal specie independently reproduced, or one animal specie supported by short-term tests. Other substances posing a significant risk are chemicals for which adverse effects have been observed in humans, particularly irreversible or progressive effects, or those chemicals having an acute toxicity of LD_{50} (oral) less than or equal to 50 mg/kg, LC_{50} (inhaled) less than or equal to 200 ppm, or LD_{50} (dermal) less than or equal to 200 mg/kg.(1)

The moderate toxicity classification includes substances which showed carcinogenic activity in at least one species of animals tested, chemicals that induce mutagenic effects in in vivo or in vitro tests, or other substances posing a health risk to humans. This last category, other substances posing a risk to humans, includes chemicals that have caused chronic adverse effects in test animals when inhaled, or are strong irritants to sensitive individuals at concentrations equal to or below the TLV. Also included in the moderate toxicity classification are chemicals having an acute toxicity where the LD_{50} (oral) is 50 to 500 mg/kg, the LC_{50} (inhaled) is 200 to 2000 mg/kg, or the LD_{50} (dermal) is 200 to 1000 mg/kg.(1)

The low toxicity classification includes chemicals that may cause mild irritation to sensitive individuals at concentrations below the TLV and have no evidence of adverse effects due to chronic exposure. Chemicals in the low toxicity group have not demonstrated carcinogenicity in test animals.(1)

Air Guide-1 states that the list of contaminants will be updated semiannually. In these updates, contaminants could be added to the list and/or their toxicity classifications could be changed. The Regional engineers review the potential emissions on each permit application and can recommend that the Toxic and Radiation Section add certain contaminants to the list.

Acceptable Ambient Levels--

Acceptable ambient levels (AAL's) are based on an annual average at an off-site receptor and are considered as an incremental measurement above nonindustrial background. The nonindustrial background would be determined by ambient air monitoring and added to the AAL. However, this is not done routinely. If modeling indicates that the ambient concentration resulting from the source's emissions is very close to or exceeds the AAL, then the applicant may be requested to perform ambient monitoring. If the total ambient concentration exceeds the AAL, it would then be necessary to identify the nonindustrial background.

AAL's are determined in three possible ways. First, the DOH has determined AAL's for 13 of the 215 contaminants listed in Air Guide-1. DOH will continue to determine AAL's at a rate of about 15 chemicals per year according to priorities set by DEC. High priority air contaminants for DOH review are substances of immediate concern such as one involved in a pending application, substances listed in Air Guide-1 as highly toxic, or substances used in relatively large volumes in New York. If the AAL has not been developed by DOH, then it would be determined by applying a factor to the ACGIH TLV. If a toxic contaminant listed in a permit application has no TLV, DOH determines the AAL for contaminants listed as highly toxic and DEC with DOH review determines the acceptable level for the moderate and low toxicity classifications. Toxicity data may be requested from the permit applicant if it is not already available to DEC or DOH.

For suspected carcinogens, DOH uses risk analysis procedures to calculate AAL's. To perform risk analysis, the department begins by conducting a thorough literature search, examining test data on the particular substance. DOH then uses the GLOBAL multistage model(7) with the best data available to them. Currently, DEC and DOH use a lifetime carcinogenic risk of one in 1,000,000 to the most exposed individual as an acceptable guideline. However, a lifetime cancer risk of one in 100,000 is currently under consideration. In the future, it is likely that the acceptable risk level will be the subject of a public hearing. In some cases, the permit applicant has toxicity information relating to risk assessment and this is considered by DEC and DOH. The DOH staff stressed the importance of professional judgement in performing risk analysis.

For contaminants with ACGIH TLV's, the AAL depends on the toxicity classification. The AAL for high toxicity contaminants is determined by multiplying the TLV by a factor of 1/300. In addition to meeting this AAL, sources of highly toxic contaminants must install the best available control technology (BACT). For substances in the moderate toxicity classification, the AAL is determined by TLV/300. Substances not among the 215 listed in the Air Guide-1 are assumed to be in the moderately toxic group. The factor of 300 consists of two components. A factor of 3 is used to convert the 8-hour workplace TLV to an ambient exposure for 24 hours per day. A factor of 100 is used to reduce the exposure of the general public compared with the industrial worker, taking into account the greater sensitivity of children and elderly people as well as involuntary exposure compared to the voluntary exposure of the worker.(1)

The AAL for low toxicity chemicals is defined as TLV/50. This lower factor is considered adequate for less toxic substances.

For some substances, determining the AAL by applying the appropriate factor to the TLV may result in an ambient concentration greater than the odor threshold value for that substance. In this instance the RAPCE must determine if there is potential for a significant nuisance and if so, the lower odor threshold must be used as the AAL.(6) Odor thresholds are listed in the DEC process source handbook.

Emission Inventory: Air Pollution Source Management System

As mentioned in the summary of the permitting process, after the RAPCE has verified the information on the permit application, the information is entered directly from the application into the Air Pollution Source Management (APSM) System.(8) The APSM system is a computerized data base that provides for storage and retrieval of administrative and technical information from the most recent (or current) application for permits to construct (PC) and certificates to operate (CO). It contains data on criteria and noncriteria air contaminants and includes all applicable sources of air contaminants in the State. The Bureau of Information Systems Development will be automating Air Guide-1 permit evaluation within the next 3 months. Toxicity information for every contaminant will be stored in the system, allowing the computer to compare the concentration estimate for each source, based on stack parameters, to the AAL's.

The data storage technique utilizes magnetic disk direct access storage via index sequential processing. The system operates on a Honeywell 6060 computer with terminals in each regional office.(8) The data base consists of two types of informational files: current master files and historical files. The 11 current master files consist of the most recent (or current) PC's and CO's. These files include information such as the facility name and address, process description, control equipment, and CAS registry numbers for each substance emitted. Historical files contain annual emission data on criteria pollutants and annual fuel usage data. These files are summarized from current master files.(8)

Estimation of Source Emissions

Before comparing the ambient concentration resulting from the source's emissions to the AAL, the source's ambient contribution must be estimated based on the stack parameters specified in the permit application. There are four sequential methods available to the RAPCE for making this estimation and each method is more complex and precise than the preceding one. In the initial screening method, source parameters such as volumetric flow rate and emission rate are used to determine the in-stack concentration. This concentration is divided by 10 and if the quotient is less than the AAL, no further analysis is required.

If the AAL is exceeded, the RAPCE would use the next level of analysis which involves estimating the annual average ambient concentration due to the source, based on the worst case 90-day impact. The 90-day impact is calculated from the effective stack height and the source's emission rate in pounds per hour, available from the permit application. The effective stack height is equal to the building height if the building is more than twice the height of the stack. If the emissions are from irregular vents or from sides of buildings, then the effective stack height is equal to the height of the emissions. If neither of these cases applies, then the effective stack height is calculated based on the actual stack height and the buoyancy flux parameter. The buoyancy flux parameter is a function of stack gas velocity, gravitational attraction, stack outlet radius, and stack gas exit temperature. Using the effective stack height, the RAPCE estimates the corresponding 90-day ambient concentration due to the source from the graph shown in Appendix A. This graph was derived using an emission rate of 100 pounds per hour. Therefore, to determine the 90-day concentration for a specific source, the following equation is used:

$$C_s = \frac{CQs}{100} \qquad (2)$$

where C_s is the ambient concentration due to the source,

C is the ambient concentration from the graph in Appendix A, and

Q_s is the emission rate of the contaminant from the source.

The 90-day average concentration is converted to an annual average concentration by dividing by 2. If this quotient exceeds the AAL, then the third, more refined modeling method is necessary. For this site specific modeling, a model such as the Climatological Dispersion Model is used to better define annual impacts. If results from this model are still unacceptable, still more refined modeling using hourly meteorological data might be required of the source.(6)

When there are multiple sources of a given contaminant from the same facility, the same screening and modeling procedures would be applied to each source and the individual impacts summed to determine the worst case maximum annual impact. If the multiple sources represent different facilities within a geographical area, then the Division of Air recommends that combined impacts should be determined only for sources within about 5 kilometers of each other.(6)

Even though the main emphasis is on the estimation of annual impacts, an estimate of 15-minute impacts from the source is made in three cases. Fifteen minute impacts are important for low toxicity contaminants, for sources that operate for a short period of time annually, and for sources having highly variable emission rates with large excursions above the average emission rate used to estimate annual impacts. The estimated 15-minute impact is considered acceptable if it is less than the TLV for the contaminant. Experience has shown that if annual impacts are less than 1/300 of the TLV, then the short-term 15-minute impacts will meet the TLV. Thus, analysis of 15-minute impacts for high or moderately toxic air contaminants is not usually done. However, for low toxicity compounds it does not necessarily follow that the 15-minute impact will meet the TLV even though the annual impact is equal to the TLV/50. Thus, a model of the short-term impact is appropriate for low toxicity contaminants.(6) For sources that operate for only a short time during the year, the average annual impact may be below the AAL, but at the same time, the short-term impact could be greater than the TLV.

Control Requirements

Sources of toxic air emissions must meet a stack limit calculated based on the AAL and specified in the permit as well as meeting air cleaning requirements specified in DEC's administrative regulations. All sources of process emissions, including those that emit toxic air contaminants are required to meet these air cleaning requirements.(5) The administrative regulations (Part 212) specify the degree of air cleaning required based on emission rate potential (lbs/hr) and an environmental rating. There are four possible environmental ratings (A,B,C or D) assigned by the RAPCE based on toxicity of the contaminant, location of the source with respect to homes or areas of anticipated growth, emission dispersion characteristics at or near the source, and the projected maximum cumulative impact taking into account emissions from all sources.

Any source that emits a contaminant in the highly toxic category is required by these administrative regulations and by Air Guide-1 to install the best available control technology (BACT). This requirement applies to new sources as well as to existing sources. BACT is determined by the permit applicant with review by the Region. If the maximum emission rate without control is less than 1.0 pound per hour for a highly toxic substance, the RAPCE has an option of waiving the BACT requirement if the source's emissions will not result in an ambient concentration at any off-site receptor that is greater than the acceptable ambient level. Sources that emit low or moderately toxic substances would be required to meet the specified air cleaning requirements, but are not required to install BACT.

Control requirements necessary to meet the acceptable ambient level are specified in the permit.

Compliance and Noncompliance

Each certificate to operate specifies a calculated stack emission limit based on the acceptable ambient level. Compliance with the permit conditions is determined when appropriate by stack testing conducted by the State or by the source owner with State staff observing.

If a source is found to be out of compliance, the State generally tries to reach a consent agreement with the source owner. In this case, the State and the source owner agree on when the source will come into compliance and what will be done. A performance bond may be required from the source owner to ensure that the schedule will be met. If the State and the source owner cannot reach a consent agreement, the owner is entitled to an adversary hearing conducted by an administrative hearing officer appointed by the Commissioner of Environmental Conservation. Such hearings are rare. The Commissioner of Environmental Conservation may impose fines for permit violations, but this occurence is also rare.

Air Monitoring Program for Toxics

Ambient--

The Air Quality Surveillance Section in the Division of Air conducts an ambient air monitoring program for selected toxics to gather background data and develop a long-term profile on toxic air contaminants. The State currently has a pilot program underway where ambient monitoring for certain toxics is being conducted at six sites representing rural, residential/industrial and urban areas. All six sites were already part of the total suspended particulate (TSP) monitoring network. Selection of the monitored substances was based on awareness of certain substances on the part of the Air Quality Surveillance Section, on priorities of other departments, or on ease of laboratory analysis.

Two monitoring methods are used in ambient air monitoring for the selected toxics. Florisil cartridges are used to collect PCB's, lindane, and seven phthalates. TSP filters are used to collect benzo[a]pyrene and heavy metals including lead, cadmium, copper, zinc, and nickel. The filters are connected to a modified hi-vol unit that takes 24-hour samples once every 12 days. Analysis of ambient samples is done in the DOH lab.

Site Specific--

The Air and Noise Studies Section conducts site specific ambient air monitoring designed at the request of a region, program unit, or local air agency. Use of the results depends on the needs of the requesting agency. One recent project was dust monitoring at the Love Canal demolition site. This study was requested by the DOH safety officer and consisted of a network of hi-vol and tape samplers. Another recent project, also conducted at a chemical dump site, consisted of real time toxics measurements at two fixed stations. In this case, monitoring was done to determine if the industry should temporarily shut down the cleanup operation. The primary interest was in acute exposure, based on the 15-minute impact. The State considers the 15-minute impact acceptable if it is less than the TLV of the contaminant. The State has the capacity to determine how much of a given substance is present at a dump site, but not to identify all of the chemicals deposited there.

Stack Monitoring--

The Source Testing Section has four main responsibilities in regard to stack monitoring. First, this Section conducts stack sampling for compliance determination. (Routine stack monitoring required in a permit is the industry's responsibility.) The Source Testing Section uses EPA reference methods found in 40 CFR 60, Appendix A. If there is no EPA reference method, DEC, in conjunction with the DOH laboratory, would develop test methods. Second, this section directs field staff in fuel sampling for burnable chemical wastes. The third responsibility is to review protocol submitted by industry for tests and monitoring that the industry will conduct. In cases where the industry is required to sample for a substance with no reference method, the source owner proposes a test method which is reviewed by DEC and DOH. Finally, this section witnesses stack tests. Such tests may be a condition of the certificate to operate.

Air Guide-1 Review Process

Figure 5 summarizes the process for permitting sources of toxic air pollutants.

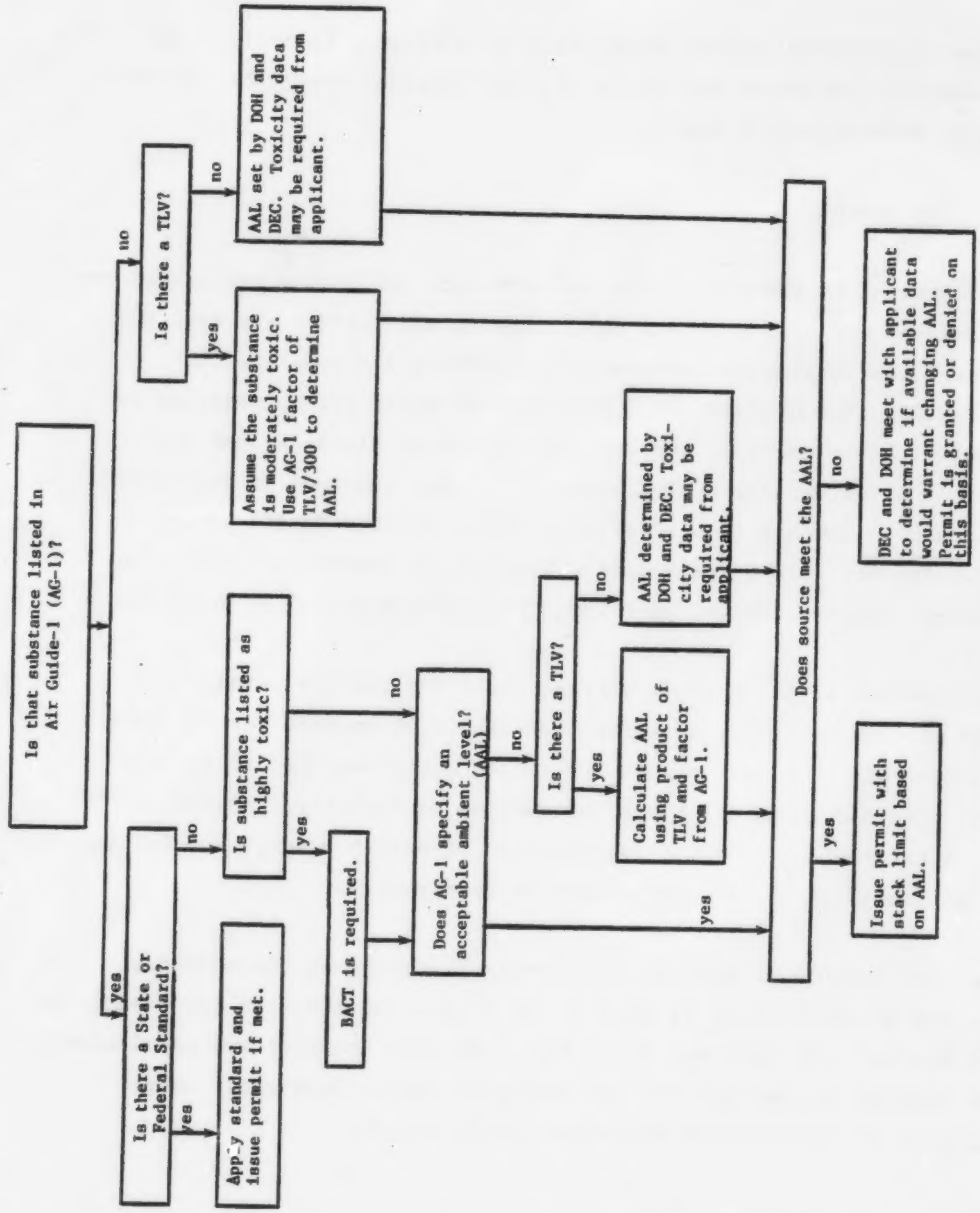
Is that substance listed in Air Guide-1 (AG-1)?
yes
no
Is there a State or Federal Standard?
yes
Apply standard and issue permit if met.
no
Is substance listed as highly toxic?
yes
BACT is required.
no
Does AG-1 specify an acceptable ambient level? (AAL)
yes
no
Is there a TLV?
yes
Calculate AAL using product of TLV and factor from AG-1.
no
AAL determined by DOH and DEC. Toxicity data may be required from applicant.
Is there a TLV?
yes
Assume the substance is moderately toxic. Use AG-1 factor of TLV/300 to determine AAL.
no
AAL set by DOH and DEC. Toxicity data may be required from applicant.
Does source meet the AAL?
yes
Issue permit with stack limit based on AAL.
no
DEC and DOH meet with applicant to determine if available data would warrant changing AAL. Permit is granted or denied on this basis.

Figure 5. New York's air toxic permit review process.

ADMINISTRATIVE ISSUES

Other significant points about New York's program to control air toxics warrant discussion and can be grouped together under the general heading of Administrative Issues.

Outside Involvement

Involvement by the public and industry occurred during the development of Air Guide-1 and occurs as the guidelines in Air Guide-1 are applied. Air Guide-1 was reviewed by several groups during its development including DOH. The Division of Solid Waste Advisory Group, composed of 14 industry, environmental, and legislative representatives, and the Division of Air's Council of Technical Resources, composed of representatives from industry, academia, and consulting firms reviewed drafts of Air Guide-1. The New York State Business Council, an industrial lobby, has reviewed Air Guide-1 and has been invited to supply technical information.

Application of Air Guide-1 does not call for the formation of a panel of experts to review specific questions, but outside review takes place in two ways. First, permit applicants are encouraged to discuss toxicity data and to submit their information on toxicity. Second, the DOH Technical Advisory Commission, composed of health experts and industrial representatives, is an informal source of peer review.

Another example of outside involvement occurring is the workshop held in one of the Regions to explain Air Guide-1 to industry representatives in that Region. The Regional staff felt that this workshop was particularly helpful because Air Guide-1 has not undergone public hearings. Other Regions plan to hold similar workshops in the future.

Operation of Air Guide-1 to Date

New York has a legislative requirement that all Department of Environmental Conservation rules and regulations must undergo a public hearing before promulgation. Air Guide-1 has not undergone such a hearing and none is planned. Therefore, Air Guide-1 is considered a guideline rather than a regulation. The State grants permits based upon these guidelines for implementing an existing regulation (Part 212) and then has the legal authority to enforce the conditions of the permit.

Air Guide-1 has been in use since December 1981. During the first six months of applying Air Guide-1, the Buffalo/Niagra Falls Region has reviewed 500 permit applications involving toxic emissions. This permit load is slightly higher than the eight other regions. Of these 500 applications, 3 were referred to the Toxics and Radiation Section for further study.

An estimate of the emission reduction attributable to the guidelines in Air Guide-1 cannot be calculated at this time because the guidelines are relatively new and because industry usually proposes adequate control measures.

To date, there have been no legal challenges to the Air Guide-1 system. The New York Business Council has asked for modification of the 13 AAL's recommended by DOH pending documentation of these levels. The DEC is obtaining the requested documentation on a case-by-case basis.

State Implementation Plan Requirements

Some sources emit toxic air contaminants such as volatile organic compounds (VOC) or particulate matter that would be covered under State implementation plan (SIP) requirements as well as the guidelines in Air Guide-1. Part 212, DEC's administrative rule for process and exhaust and/or ventilation systems, states that the toxic properties of VOC and particulate matter emissions from several specific processes must be considered under the environmental rating system outlined in this part.(5)

Toxic emissions from these processes would be limited by the more stringent Air Guide-1 rather than by the SIP requirements for these processes.

Since Part 212 applies only to process, exhaust and/or ventilation systems, toxic emissions from other sources such as incinerators, boilers, and resource recovery operations are not regulated under guidelines in Air Guide-1.

Level of Effort Required for Air Toxic Regulation

The development of Air Guide-1 required approximately 5 work-years at a cost of about $250,000. Most of the work was done over an 18-month period by a toxicologist, chemical engineers and other technical staff. The Administration of Air Guide-1 is delegated to the engineers in the nine Regional offices with special questions referred to the various units in the Division of Air.

New York's Evaluation of the Air Toxics Program

Members of the Division of Air cited seven principle strengths of their program for regulating air toxics. First, the generic approach of Air Guide-1 allows the State to regulate all of the approximately 2,000 air contaminants emitted. The State formerly had guidelines for only a specific list of compounds but found this approach too limiting. The other strengths cited included improved protection of the public and the environment, a consistent approach applied by all nine regions, the ability to make timely decisions, screening procedures based on conservative assumptions, flexibility to cope with unique situations, and routine input from DOH health specialists.

The staff cited four problem areas. First, resource constraints limit the amount of ambient monitoring the State can conduct and increase the turnaround time DOH gives on special DEC requests. Second, the state of the art in toxics measurement and control is in constant change. This complicates industry planning. For example, a source owner may comply with permit requirements by installing the best available control technology only to find that the control technology has changed when the permit must be renewed. The State attempts to use reasonable compliance schedules in such cases. A third problem is the lack of analytical methodology to measure some toxic contaminants. Fourth is the need to develop understanding of toxic emissions and trust of DEC's decisions among the public, industry, and legislators.

Lessons Learned Through Application

The Division of Air has continued to emphasize the importance of educating industrial representatives in the process. The Regional workshops for industry have helped this process. The Air staff also emphasized the importance of documenting sources used in the development of setting acceptable ambient levels.

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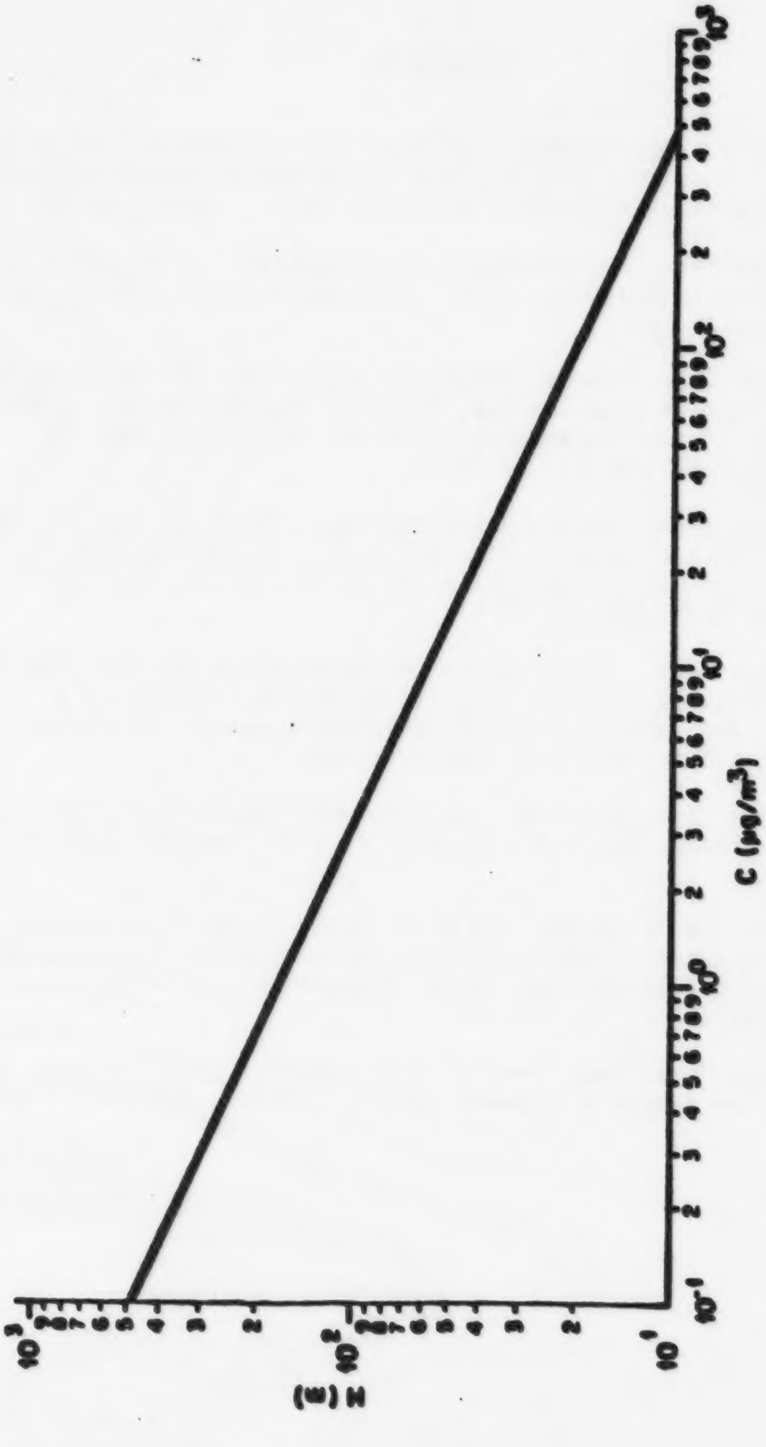
APPENDIX C. NINETY-DAY CONCENTRATIONS (C) FOR VARYING EFFECTIVE STACK HEIGHT (H).



SECTION 8

AIR TOXICS CONTROL STRATEGIES: STATE OF KENTUCKY

BACKGROUND INFORMATION

Initiation of Air Toxics Control

Kentucky began regulating toxic air pollutants in 1978. Initiation of the program was due to a general awareness on the part of the Division of Air Pollution Control staff of the potential adverse effects on public health caused by toxic air pollutants. This recognition led to the promulgation of an administrative regulation for the control of potentially hazardous matter and toxic substances.

Enabling Legislation

The Kentucky Environmental Protection Law, passed in 1966 and amended most recently in 1982, established the Natural Resources and Environmental Protection Cabinet. The Cabinet is headed by the Secretary, an appointee of the Governor, and has the authority to promulgate rules and regulations and to issue permits pursuant to its responsibilities for managing and protecting air resources. This general responsibility for protecting air resources includes the authority to limit emissions of toxic air contaminants as well as other air contaminants.

The legislation gives a broad definition of the terms "air contaminant" and "air pollution". "Air contaminant" is defined as

> ". . . smoke, dust, soot, grime, carbon, or any other particulate matter, radioactive matter, noxious acids, fumes, gases, odor, vapor, or any combination thereof."(1)

"Air pollution" is defined as

> ". . . the presence in the outdoor atmosphere of one or more air contaminants in sufficient quantities and of such characteristics and duration as is or threatens to be injurious to human, plant, or animal life, or to property, or which unreasonably interferes with the comfortable enjoyment of life or property."(1)

Pursuant to its general authority to control air pollution, the Natural Resources and Environmental Protection Cabinet has adopted several rules. The primary rule invoked in the program to regulate air toxics requires that sources adequately control "potentially hazardous matter and toxic substances." The rule defines "potentially hazardous matter and toxic substances" as

> ". . . matter which may be harmful to the health and welfare of humans, animals, and plants, including, but not limited to, antimony, bismuth, lead, silica, tin, and compounds of such materials."(2)

This rule pertains to emissions of substances for which State or Federal standards specific to that substance do not exist.

The rules requiring construction permits, compliance schedules, and permits to operate are also involved in controlling air toxics. The rules provide for the opportunity for public comment and a public hearing on permit applications for major source construction or major modifications (i.e., sources having the potential to emit 100 tons per year or more of any one pollutant.)

State Organization for Control of Air Toxics

The Natural Resources and Environmental Protection Cabinet includes the Department for Environmental Protection which is made up of the Air, Waste, and Water Divisions. The Air Division reviews and issues all air permits, including those involving toxic pollutants. This Division also maintains the Computerized Emissions Inventory System and conducts some ambient monitoring for air toxics. Permitting is done by the staff of approximately 20 engineers. Epidemiological expertise is available in the Office of the Secretary of Natural Resources and Environmental Protection. Interaction between the Air Division and divisions responsible for other media is not routine except in matters concerning incineration of air toxics. In the case of radioactive emissions, The Air Division consults the Department of Human Resources.

OVERVIEW OF REGULATORY PROGRAM

Function

Kentucky's air toxics control program consists of procedures for determining an allowable ambient concentration which is used to determine whether a permit should be granted.

Scope

Kentucky's permit evaluation procedure examines all emissions from a particular source. Guidelines for toxic emissions are applied to substances for which there are no specific State or Federal standards. In other words, the toxics procedure would not apply to sources of criteria pollutant emissions (sulfur oxides, particulate matter, carbon monoxide, ozone, volatile organic compounds, nitrogen dioxide, and lead), sources of pollutants covered by National Emission Standards for Hazardous Air Pollutant (asbestos, beryllium, beryllium rocket motor firing, mercury, and vinyl chloride), or industrial sources for which emission standards have been established in State rules or Federal New Source Performance Standards. Any new or modified source must obtain a construction permit and a permit to operate. A modification means a change which increases the potential to emit a substance previously emitted or which results in emissions of a substance not previously emitted. There is no minimum emission cutoff below which a source would be exempt from these requirements. Sources are not required to renew permits to operate unless changes are made in equipment or processes.

Summary of Permit Review Process

Kentucky's permit review process evaluates all emissions from a source, including air toxics. As it applies to toxic air pollutants, the permitting procedure can be summarized in four steps. First, the permit applicant must list all emissions (criteria as well as noncriteria pollutants) with emission rates and stack parameters. These inventory data are submitted with the permit application and are stored in the computerized Emission Inventory System.

In the second step, Air Division personnel determine the allowable ambient level. In the past, this level has been determined by applying a factor to the threshold limit value (TLV) developed by the American Conference of Governmental Industrial Hygienists (ACGIH). Recently, however, the State has used risk assessment to aid in determining the acceptability of the risk associated with certain carcinogenic emissions that would be emitted from a synfuels plant.

In the third step of this process, the State staff determines the maximum ambient concentration beyond the fenceline resulting from the facility's emissions and compares it to the allowable ambient concentration. To determine the maximum concentration beyond the fenceline, Air Division engineers use a computerized dispersion model, supplying the type of emissions and the stack data from the permit application. This preliminary modeling procedure takes less than 1 hour to perform. If the facility's fenceline concentration is below the allowable ambient concentration, the permit would be granted. If not, the State would perform more detailed modeling using more sophisticated meteorological data. If the second model indicated a fenceline concentration less than the allowable ambient concentration, the permit would be granted. If the fenceline concentration were still too high, the State would inform the applicant that emissions of that toxic pollutant must be reduced before the permit could be granted.

The fourth step in the process is to grant or deny the permit. If the maximum concentration beyond the fenceline of the facility is below the allowable ambient level, the permit would be granted. The permit would specify a stack emission limit in pounds per hour calculated based on the allowable ambient concentration and the stack parameters listed in the application. The permit would also specify any monitoring or operating requirements. Control measures necessary to meet the allowable ambient concentration are listed in the original permit application or in an amended application. The permit references the control measures specified in the application and requires that they be implemented but does not repeat these measures.

AIR TOXICS CONTROL PROGRAM IMPLEMENTATION

The following sections explain in more detail determination of the allowable ambient concentration, the Emission Inventory System, estimation of the source's fenceline concentration, the permit requirements, and the monitoring program.

Determination of the Allowable Ambient Concentration

Adjusted TLV --

Kentucky has traditionally relied on ACGIH time weighted average TLV's in determining what the Air Division considers safe ambient concentrations for hazardous substances. The Division notes that TLV's represent the concentrations to which "nearly all workers may be repeatedly exposed, day after day, without adverse effect."(3) In setting allowable ambient concentrations the Air Division staff considers two time factors: the duration of exposure and the averaging time used to measure compliance with the standard. The derivation of the maximum acceptable 1-hour average ambient concentration at ground level beyond the property boundary of a continuous emitting source is:

$$C = \frac{TLV}{10} \times \frac{8 \text{ hours}}{24 \text{ hours}} \times \frac{5 \text{ days}}{7 \text{ days}} \qquad (1)$$

or TLV/42. This formula converts the 40 hour work week exposure time which is the basis for the TLV to continuous exposure. The formula also accounts for the greater susceptibility of the general population compared to a healthy worker by dividing the TLV by a factor of 10 and by reducing the averaging time for compliance from 8 hours to 1 hour. This reduction in the averaging time adds an additional safety factor of about 30 percent.(3)

If a facility would emit a toxic substance for which there is no TLV, the Air Division uses the TLV of a similar, usually more toxic compound to calculate the acceptable ambient level. Similar compounds are determined on a case-by-case basis using literature references or consulting with experts. The staff noted that if a compound for which there is no TLV contains some trace element such as chromium, they could use the TLV for a general classification of chromium compounds.

Risk Assessment --

Kentucky has used risk assessment to determine if emissions from a proposed synfuels plant would present a significant health hazard. This is the first instance where Kentucky has singled out carcinogenic substances from other air toxics for analysis and permitting.

The risk assessment was performed by a panel of national experts from academia, the Federal government, and consulting firms. The panel was assembled and financed with assistance from U. S. EPA, Region IV. The panel addressed issues such as which substances were considered carcinogenic and the type of data that should be considered. The panel relied upon their professional expertise in determining which synfuels emissions should be considered carcinogenic. Mutagens were not singled out for special analysis in the synfuel plant study. The Air Division staff commented that, in the future, a substance that showed mutagenicity would probably be assumed to be carcinogenic.

In the analysis, the panel assumed the risks from all pollutants from the source to be additive. The risk assessment was based on the linear nonthreshold model which assumes that even the smallest amount of a carcinogen will pose some risk to the exposed population. Potency data were based on a comparison between mammalian skin painting tests and studies of the carcinogenic effects of coke oven emissions on humans.

The results of the panel's risk assessment were expressed in terms of the expected lifetime risk of the most exposed individual developing cancer and the number of excess deaths that would be expected to occur in the exposed population over a lifetime. The projections for excess deaths indicated that less than one cancer death in the exposed population over a lifetime would be expected to result from the plant's emissions. Based on the excess death analysis, the Air Division has tentatively recommended approval of the permit. In this case, no allowable ambient concentration was determined. Instead, based on the panel's information, it was determined that the effect on off-site receptors would be acceptable.

Emission Inventory System

The emission data from each permit application are entered into the Emission Inventory System. This computerized system is a compilation of emission data from permit applications for criteria and noncriteria pollutants. The inventory system stores data in four segments: plant identification, point source description, machine process information, and general notes. The plant identification segment compiles data on the plant such as location, number of employees, acres of property, and results of the last State inspection. Data on point sources include stack parameters, pollutants emitted, cost and efficiency of control equipment, and actual and potential emissions in tons per year. The machine process segment stores data on operating rate, design rate, source description, and emission factors for the various pollutants. A segment for general notes is provided for any information the State feels should be kept about a certain plant. The Emission Inventory System is used to store historical data, make future emissions projections, and to determine the emission reductions accomplished and the cost of control.

Estimation of Source's Ambient Impact

In order to compare the allowable ambient concentration to the ambient concentration resulting from the source's emissions, the Air Division must estimate the maximum ambient emission concentration beyond the fenceline. Kentucky uses an initial computerized screening model to quickly determine if a source will meet the allowable ambient concentration. This model, known as the point max model, gives the maximum ambient concentrations for each atmospheric stability catagory based on the emissions and stack data in the permit. This screening is completed in less than 1 hour. If the source's maximum concentration at the fenceline is less than the allowable ambient concentration, the permit would be granted. If not, the Air Division staff would do more detailed modeling using the CRSTER model with a year's period of more detailed meteorological data. The results would reflect more precise maximum 1 hour ambient concentrations. If the results of this modeling indicated that the source's ambient concentration was acceptable, the permit would be granted. If not, Air Division staff members would inform the applicant that emission reduction was necessary.

Permitting

The decision criterion for granting a permit involving toxic air pollutants is the source's ability to meet the allowable ambient concentration for a 1-hour averaging time. The permit specifies a stack limit in pounds per hour calculated from the allowable ambient concentration and the source's stack parameters.

Most applicants propose adequate control measures in the permit application to meet the allowable ambient level. If the analysis done during the State's review of the permit application indicates that the source will not meet the allowable level with the proposed control measures, then the applicant would have an opportunity to amend the permit application proposing adequate control measures. The permit references the control measures specified in the application, requiring that they be implemented.

Some applicants for permits to operate must perform an initial performance test to ensure that the source can meet the stack emission limit. Based on the results of this test, the permit specifies conditions such as the maximum operating rate and the maximum percentage content of the toxic substance in the process materials. Permits also include recordkeeping requirements. The source's records are available for inspection by State personnel.

Monitoring requirements are not commonly specified in permits involving toxics. However, both ambient and stack monitoring are likely to be required at the proposed synfuel plant. The duration of the required monitoring will depend on the preliminary results.

After the Air Division has issued a decision either granting or denying a permit, disatisfied parties may request a formal hearing within 30 days after the decision. This hearing would be held before a hearing officer appointed by the Natural Resources and Environmental Protection Cabinet. The hearing officer makes a recommendation to the Secretary of the Cabinet who issues the final order. Permit applicants still disatisfied could take the issue to State court.

Monitoring Program

Kentucky presently does not do routine ambient monitoring for toxic pollutants other than lead. The State does, however, maintain hi vol filters that can be analyzed for specific compounds. The State formerly monitored for about 15 heavy metals for a period of 15 years in order to establish a historical basis. This program was reduced to five metals and eventually eliminated due to lack of resources.

ADMINISTRATIVE ISSUES

Other significant points about Kentucky's program to control air toxics warrant discussion and can be grouped together under the general heading of Administrative Issues.

Outside Involvement

The development of Kentucky's air toxic control program did not include public or industry participation. However, there is an opportunity for public and industry involvement in the permitting process. After a preliminary determination has been made on a permit application, a public hearing can be requested by a member of the public if the source is considered a major source (i.e., it has the potential to emit 100 tons per year or more of any one pollutant) or if the Air Division feels there is a great deal of public interest in the source. In addition to the public hearing or in place of it, depending on the size of the source, the Air Division may issue a notice requesting public comments. At the hearing or in the comment period, industry representatives and the public may supply any data and make comments which must be considered in the Secretary's final determination.

A second means for outside involvement is the consultation with a panel of experts such as the panel assembled for the synfuels plant risk assessment. Kentucky does not have a permanent panel for air toxics issues but consults various experts as the need arises.

Operation of Air Toxics Program to Date

Kentucky has been regulating sources of toxic air pollutants since 1978. The Air Division Staff pointed out that during this period, the program has continued to evolve and has become more complex. At one time, the State considered promulgating ambient standards for toxic air pollutants but abandoned this approach due to complications such as the constant developments in the field of toxicology. The Air Division formerly regulated only substances for which there were ACGIH TLV's but now covers other compounds as well.

The Air Division processes about 150 to 200 construction permits per year. About 10 percent of these permits involve emissions of toxic air pollutants and very few of these are required to use additional control measures beyond those originally proposed in the application. To date, no enforcement actions have been taken in regard to air toxics.

Level of Effort Required for Air Toxics Regulation

Administration of the air toxics program is shared by about 20 engineers in the Air Division for a cost of approximately $80,000 per year. The synfuels project has required about 1 work-year of Air Division staff work, plus the time required of the panel members for a total cost of about $40,000. The entire panel met on two occasions and several members were present for a third meeting held to brief the Secretary of Natural Resources and Environmental Protection.

Relationship to State Implementation Plan (SIP) Requirements

Kentucky's air toxics program covers substances and sources for which there are no specific State or Federal standards. If a source emits a toxic volatile organic substance for example from a process covered in the SIP, the source would be covered by the SIP VOC standards rather than by control measures which would result from the air toxics procedure.

Kentucky's Evaluation of the Air Toxics Program

Members of the Air Division staff felt that the existence of their air toxics program is its main strength. They feel the program is an important factor in the protection of public health and have been pleased by industry's acceptance.

The staff cited two problem areas. First was the difficulty in finding reliable, complete information on which to base decisions. Second was complaints by industry over the 1-hour averaging time for the maximum ambient concentration. Many industry representatives favor an annual averaging period instead, but State officials feel this makes the requirements too lenient.

The Air Division staff also noted certain limitations in the application of TLV's to air pollution control. These limitations include,

> ". . . i) Threshold Limit Values are based on the best available information from industrial experience, from experimental human and animal studies and, when possible, from a combination of the three. Only in very few instances have the values been established firmly on a basis of examinations of human subjects correlated with adequate environmental observations,
>
> ii) Synergistic effect of mixtures of substances are not considered,
>
> iii) Individuals vary in sensitivity or susceptibility to toxic substances,
>
> iv) Often a single value is given for substances which occur in different forms and may indeed have different toxicities,
>
> v) A worker during a normal work week (8 hours per day, 5 days per week) has 40 hours of exposure per week with daily and weekend periods in which to recover from insult injury and allow the body to excrete accumulated substances before toxic levels are reached. For a person living continuously in an environment polluted by such substances, these recovery periods may not necessarily exist and exposure of up to TLV levels may therefore subject the person to an unacceptably high risk of poisoning."(3)

Recommendations to Other States

The Air Division staff recommended that states interested in developing an air toxics control program study existing state programs and choose a method that will meet their needs. Kentucky contacted all 50 states in early 1982 and found it quite helpful to learn from other programs.

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SECTION 9

AIR TOXICS CONTROL STRATEGIES:
STATE OF CALIFORNIA

BACKGROUND INFORMATION

Initiation of Air Toxics Control(1)

The California Air Resources Board (ARB), responsible for protecting human health and welfare from the adverse effects of air pollution, began in 1977 to improve both public and scientific understanding of the various aspects of toxic air contaminants. In 1977, ARB appointed an ad hoc panel of recognized experts in the field of chemical carcinogens to evaluate the nature of carcinogenic air pollutants in California. The panel's report to the Board made in 1979 represents the Board's initial effort to address air toxics.

ARB has recognized the need for a program which applies specifically to the problem of toxic air contaminants in California. The ARB staff noted that air toxics are not specifically or adequately covered by in most current regulations, yet many of the substances are known or suspected human carcinogens or may have acute or chronic adverse health effects.

In May 1982 the ARB staff completed a report titled "A Proposed Program for Reducing Emissions of Toxic Air Contaminants in California."(1) The report was prepared for review by the Board as a means of giving the staff further direction for the toxic air contaminant program. After review of the proposed programs and comments from the staff, the Department of Health Services, air pollution control districts, other public agencies and members of the public, the Board issued the following list of directives to the staff:

> "1. Identify and prioritize, for the purpose set forth below, airborne toxic substances.
>
> 1a. Prepare a list of substances under consideration and distribute, for information, to the public, local air pollution control districts and industries potentially affected.
>
> 2. Identify existing source categories which emit toxic air pollutants.
>
> 3. Develop a program for the monitoring of ambient concentrations of toxic air pollutants.
>
> 4. Based on information developed in steps 1 and 2, work through the Technical Review Group with air pollution control districts, and in consultation with the Department of Health Services, local health agencies, the public, industries and other governmental agencies, to develop control measures for stationary sources of emissions of toxic air pollutants.
>
> 5. Develop ambient air quality standards for toxic air pollutants where supporting information is available which indicates the appropriateness of this approach.
>
> 6. Investigate control measures which will reduce the emissions of toxic air pollutants from vehicular sources.
>
> 7. Develop in conjunction with the districts a policy for the control of new sources of toxic air pollutants."(2)

The ARB staff is currently working on several parts of a regulatory program such as a siting policy(3) and a policy for reviewing new or modified sources of toxic air contaminants(4) in order to begin systematically regulating sources of air toxics.

In September 1982, the ARB staff completed proposed amendments to the California Administrative Code specifically regarding emissions of toxic air contaminants.(5) The staff paper on the proposed amendments summarized data on annual emissions and ambient concentrations of toxic air contaminants in California and suggested an approach to implementing control. The approach to control of air toxics presented here is based on the approach described in the ARB staff paper on the proposed amendments.

Enabling Legislation

The existing legislation enabling the control of air pollution in California is a broad authority for control found in the Health and Safety Code in the division pertaining to air resources. The Health and Safety Code broadly defines "air pollution" and "air contaminant" as

> ". . . any discharge, release, or other propagation into the atmosphere and includes, but is not limited to, smoke, charred paper, dust, soot, grime, carbon, fumes, gases, odors, particulate matter, acids, or any combination thereof."(6)

This legislation includes a general nuisance provision prohibiting discharge of air contaminants which cause "injury, detriment, nuisance, or annoyance" or "endanger the comfort, repose, health, or safety" of the public or which cause "injury or damage to business or property."(6) The code gives ARB the authority to adopt standards of ambient air quality for each air basin in consideration of public health, safety, and welfare. The Health and Safety Code does not mention toxic air contaminants specifically.

In addition to the general limitation on air pollution, the Code also outlines the responsibilities and powers of the State Air Resources Board (ARB) and the local and regional authorities.

The control authority granted in the Health and Safety Code has not been systematically used to limit emmissions of toxic air contaminants for these reasons:

> "1. Air pollution control agencies have not established a clear definition of what constitutes a toxic air contaminant;
>
> 2. Most district boards lack the resources and expertise to amass the necessary data and judge the scientific issues that must be considered to define what constitutes an endangerment to the public health and therefore are often unaware of airborne toxicant problems;
>
> 3. There is no guidance available as to the appropriate level of control to require, particularly for carcinogens and other toxic pollutants for which no safe ambient level can be identified."(5)

The ARB staff has recommended to the Air Resources Board that amendments be adopted to clarify applicability of the Health and Safety Code to toxic air contaminants. The recommended regulations define "toxic air contaminant" as,

> ". . . Any air pollutant which, in the judgement of the Air Resources Board or an air pollution control district, causes or contributes to air pollution which may reasonably be anticipated to result in an increase in mortality or an increase in serious or incapacitating illness. Substances that are carcinogenic and which are present in the ambient air are toxic air contaminants."(5)

The regulations also specify certain mimimum conditions that must be met by sources emitting toxic air contaminants. These conditions are:

> "(a) For toxic air contaminants for which there is a threshold exposure below which no adverse effects are anticipated, emisisons from the source

> shall be controlled sufficiently, including a reasonable margin of safety, so that the source will not result in or contribute to ambient levels in excess of the threshold exposure.
>
> (b) For toxic air contaminants for which there is no demonstrable safe level or threshold level of adverse health effects, including but not limited to carcinogens, emissions from the source shall be reduced to the maximum extent practicable.
>
> (c) Nothing in this section shall relieve the air pollution control districts or the Air Resources Board, as the case may be, from imposing on any source of toxic air contaminants additional or more stringent requirements or permit conditions than are set forth herein which are necessary to assure that emissions will not cause or contribute to an endangerment of the comfort, repose, health, and safety of the public or to economically significant animals or plants."(5)

State Organization for Control of Air Toxics

The Health and Safety Code adopted a regional approach to air pollution problems and gave local and regional authorities the responsibility for control of air pollution from stationary sources. These groups consist of County Air Pollution Control Districts or Unified Air Pollution Control Districts (APCD), also referred to as Air Quality Management Districts, consisting of two or more contiguous counties. These local and regional groups have powers including the authority to establish rules and regulations, issue permits, impose penalties, and require monitoring.

The Health and Safety Code charges the State Air Resource Board (ARB) with "coordinating efforts to attain and maintain ambient air quality standards, to conduct research into the causes of and solutions to air pollution. . . " and to control mobile sources. The ARB is composed of seven members appointed by the Governor with consent of the Senate. The seven members must consist of one member in the automotive engineering field or a closely related field; one member with training and experience in chemistry, meteorology, or related scientific fields including agriculture or law; one member who is a physician and surgeon or an authority on health effects of air pollution; one member representing the public; and three members who are elected officials from the districts.

The ARB staff is composed of the following eight divisions: Administrative Services, Enforcement, Haagen-Smit Laboratory, Mobile Source Control, Regional Programs, Research, Stationary Source Control, and Technical Services. Several of the divisions would be involved in issues concerning air toxics. The duties of each division are briefly summarized below, including the division's responsibilities in the air toxics area.

- Administrative Services Division: handles routine administrative functions for the ARB staff.
- Enforcement Division: enforces regulations set by ARB and oversees the enforcement handled by APCD's. This division would perform similar functions for the proposed air toxics program.
- Haagen-Smit Laboratory Division: conducts routine vehicle emission tests, maintains the vehicle emission inventory, and does some short-term ambient air testing and analysis projects. With regard to air toxics, this division would conduct vehicle emission tests for toxics if that is ever deemed necessary and would help develop methods of measurement and analysis for any toxic substances for which ARB sets an ambient standard. Currently, this division is conducting a short-term ambient monitoring program for eight halogenated carbon compounds in the Los Angeles area.
- Mobile Source Control Division: inspects vehicles to ensure they comply with ARB requirements. If ARB controlled toxics from mobile sources, this division would develop control requirements.
- Regional Programs Division: handles relations between State and local air programs, deals with project engineering such as siting policies, helps local districts with environmental impact evaluation and siting, evaluates air impacts of other State projects, and pulls together State and

local portions of the State implementation plan. With regard to air toxics, this division proposed a policy to ARB in September 1982 for review of new or modified sources of toxic air contaminants.(4)

- Research Division: supplies information to ARB and APCD's such as control technologies, economic impacts, and biological effects and sets ambient air quality standards. The Research Division includes the Air Quality Standards Section which deals with criteria pollutants and the Toxic Substances Standards Section which handles noncriteria pollutants. The Toxic Substances Standards Section includes experts in environmental toxicology, chemistry, and medicine. The Research Division helped to develop the recommended air toxics program.(5) Specific projects on toxics include modeling to determine ambient concentrations and carcinogenic risk assessment.

- Stationary Source Control Division: assists APCD's with various engineering problems such as estimating emissions from stationary sources and developing control strategies. Representatives of this division and members of the Association of APCD's form the Technical Review Group (TRG) which proposes suggested control measures for emissions of certain substances from stationary sources. The staff in this division includes experts in control technologies and environmental toxicology. Its duties in regard to air toxics would be similar to its current duties.

- Technical Services Division: collects air quality monitoring data for pollutants such as carbon monoxides, lead, sulfates, and particulates. This Division is the center of data processing for ARB and would handle storage and retrieval of information on air toxics such as health effects and an emission inventory. If ambient standards are developed for any air toxics, the division would include those substances in the monitoring program.

OVERVIEW OF THE PROPOSED PROGRAM

Function

The amendments to the Health and Safety Code proposed by the ARB staff will provide a basis for additional actions to reduce public exposure to levels of toxic air contaminants that could endanger public health. The regulations would also allow districts to regulate toxic air contaminants more effectively and to use resources more efficiently.

Scope

The amendment recommended by the ARB staff will apply to all sources of emissions of toxic air contaminants (nonvehicular and vehicular), for which no ambient air quality standard is applicable within the State. The toxic air contaminant regulations would not apply to the application of pesticides conducted during growing, harvesting, or processing of crops prior to shipment from the property on which the crops are grown.

Summary of the Proposed Program

The approach proposed by the ARB staff in the recommended regulations could be implemented by expanding established air pollution programs. In that case, the state staff would assume a major role in monitoring, modeling, risk assessment, and program coordination. However, the primary effort for implementation of the program as it applies to stationary sources would rest with the air pollution control districts through the rule adoption and permitting processes.

To assist the districts, provide industry with greater certainty, and to accelerate the control of airborne toxic pollutants, the ARB staff recommended the following approach:

"1) Regulatory definition of toxic pollutants which endanger the public health and identification of the general control requirements imposed by Section 41700 of the Health and Safety Code.

2) A statewide new source review policy for toxic pollutants which, when implemented by the districts, will "cap" the growth in emissions of toxic air pollutants to the ambient air.

3) Accelerated development of suggested control measures on specific categories of sources which emit specific toxic compounds. When adopted and implemented by districts which need them, these control measures will reduce emissions from existing sources.

4) The development of ambient air quality standards for toxic air contaminants for those situations in which the existence of ambient standards will define safe levels or facilitate the control of compounds for which no safe level can be determined."(5)

The recommended regulations would implement the first step of this approach and provide a foundation for steps two and three. The following sections explain each of the four steps of the ARB staff's approach in more detail.

DISCUSSION OF THE PROPOSED PROGRAM

Regulatory Requirements

As discussed in the enabling legislation section, the recommended regulations impose three minimum conditions designed to prevent emissions of toxic air contaminants from endangering public health and safety. This section will discuss each of these three minimum conditions.

Contaminants With Definable Threshold--

The first regulatory condition effects emissions of toxic air contaminants for which there is a threshold exposure below which no adverse health effects are anticipated. Such emissions shall be controlled so that ambient levels will not exceed the threshold exposure. Sources of such contaminants would be required to use sufficient emission control to ensure, with a margin of safety, that the public would not be exposed to health damaging levels of the contaminants. If sufficient emission controls are not available, the source could not be permitted as designed.

The ARB staff report on the recommended regulations pointed out that traditionally, where safe levels could be determined, ARB has established ambient air quality standards. Although some ambient standards may be adopted for toxic air contaminants, the ARB staff stressed that it is impossible to establish ambient standards for all of the hundreds of potentially toxic compounds used. The staff added that it is infeasible to wait until a problem is recognized and to delay control until a standard can be set and implementing regulations adopted. The staff feels that the proposed regulations would establish the criteria to be used by the districts and ARB in cases where action must be taken to protect public health without the benefit of an ambient standard.

Contaminants Without a Definable Threshold--

The second minimum condition in the recommended regulations calls for emission reduction to the maximum extent practicable for toxic air contaminants for which there is no demonstrable threshold level of adverse health effects. This condition applies to carcinogens, but is not limited to carcinogens. To implement this provision, districts would define emission control requirements that reduce emissions to the maximum extent practicable. Control requirements would be defined for either individual sources through permit conditions or categories of related sources through the adoption of regulations.

The staff's presentation of the proposed regulations included a review of the nature and attributes of cancer, emphasing that the progression of cancer is a multiple step process influenced by a variety of agents and factors both within and outside the body. The process is frequently influenced by age and length of exposure. The staff noted that the properties of cancer have significant implications for control of emissions. They pointed out that the irreversible nature of the genetic damage and the possibility that any exposure engenders some risk of initiation, support the policy of elimination or maximum reduction in exposure to these agents.

The regulations proposed by the ARB staff would require the same goal of control for all carcinogens (i.e. control to the maximum extent practicable). In other words, the staff does not believe substances currently labelled "animal carcinogens" should be subject to less stringent control requirements than those labelled "human carcinogens." The staff recognizes that control to "the maximum extent practicable" may not be adequate in all cases and therefore, the proposed regulations require further mitigation of emissions that would still endanger public health after the source is controlled to the maximum extent practicable.

Carcinogen Identification -- The presentation of the recommended regulations identified the following three methods for identifying carcinogens: well conducted epidemiological studies, long-term carcinogenicity animal bioassays, and single positive bioassays supported by positive findings in short-term tests.

Epidemiological studies can be used to determine statistical associations in human populations between exposure to measured substances and increased cancer risk. The staff pointed out that the major advantages of epidemiologic data is that they provide direct evidence of relationships between the factor under study and disease development in humans. The staff noted that the crucial point in defining a good study is the establishment of a causal relationship between exposure and effect, revealed by an increase in the age-specific incidence rate for cancer in the exposed versus the control population. The CARB staff concluded that positive results indicating an increase in cancers in humans in well conducted epidemiological studies provide an adequate basis to control a substance as a carcinogen.

The staff felt that the most appropriate and accurate method for assessing the carcinogenic potential of chemicals is long-term carcinogenicity animal bioassays. They noted that the limitations of epidemiology are such that it cannot be relied upon as the sole source of data for identifying human carcinogens. Testing chemicals for carcinogenicity in humans cannot be done due to ethical considerations. The staff's report cited guidelines for conducting long-term carcinogenicity bioassays recommended by the National Cancer Institute (NCI)(7) and the International Agency for Research on Cancer (IARC).(8) The report concluded that: (1) the results of long-term carcinogenicity bioassays can be used to identify chemicals as carcinogens; (2) positive results in well conducted tests cannot normally be disregarded due to non-positive results in other species or under different experimental conditions; and (3) chemicals identified as animal carcinogens should be considered to be potential human carcinogens, and should be regulated as such.

The third method cited by the staff for identifying carcinogens was a single positive bioassay supported by positive findings in short-term tests. Short-term tests measure the ability of a chemical or complex mixture to cause mutations, chromosomal alterations, DNA damage and repair, cancer-like cell transformations or tumor formation. Short-term tests take much less time to complete and cost only a fraction of long-term animal bioassays. The staff noted that, according to IARC, one of the steps in the multistep process of carcinogenesis involves some interaction of the suspect chemical with DNA. This mechanism is supported by the observation that most animal and human chemical carcinogens are positive in at least some short-term tests. The staff concluded that although short-term tests are not yet developed to the stage where they can replace whole animal bioassays, they are useful for screening potential carcinogens for future animal bioassays and to augment existing data. Because of the unacceptability of delaying control decisions for the several years necessary to complete confirmatory bioassays, a single positive bioassay supported by positive findings in short-term tests is sufficient to regulate a chemical as a carcinogen.

New Source Review Policy

The ARB staff published "A Proposed Policy for Reviewing New and Modified Sources of Toxic Air Contaminants" in September 1982.(4) The goal of this policy is,

> ". . . to provide a framework for the systematic review of new or modified sources of toxic air contaminants which would promote increased protection of public health by:
>
> - providing procedures for identifying new and modified sources which may emit toxic air contaminants;
> - minimizing to the maximum extent practicable the emissions of toxic air contaminants for which there is no demonstrable safe level or threshold of adverse health effects; and by
> - ensuring that the emissions of toxic air contaminants for which there is a threshold exposure level below which no adverse health effects are anticipated are reduced to a level which ensures that the source will not cause or contribute to ambient levels in excess of the threshold level."(4)

The policy presented by the ARB staff's report was based on the existing framework for review of new sources in California and is intended to be compatible with the districts' permit and new source siting regulations.

Classification of Toxic Air Contaminants --

According to the proposed policy, toxic air contaminants would be separated into two classes, A and B, for the purposes of new source review. Review procedures and the degree of control for new or modified sources would depend on the classification of the toxic air contaminant to be emitted.

Class A contaminants would be those for which adverse health effects have been demonstrated and for which a safe level or a threshold of adverse health effects does not exist or has not been determined. Class A would include but not be limited to carcinogens. Class B contaminants would be those for which adverse health effects have been demonstrated and for which there is a threshold exposure level below which no adverse health effects are anticipated. The threshold of adverse health effects should be considered to be the concentration and duration of exposure at which sensitive subgroups of the public may be affected.

The classification of a substance as A or B would be done by ARB or districts in consultation with ARB. The staff pointed out that there should be an opportunity for public comment prior to the designation of any substances as toxic air contaminants.

The criteria for identifying a carcinogen are described in the section on Regulatory Requirements. Criteria for identification of other toxic air contaminants were not specified with the proposed review policy, but the ARB staff recommended that identification of such compounds as well as the criteria for determining the threshold levels of adverse health effects should be done by ARB through consultation with the Department of Health Services.

Review Levels --

To ensure review of new and modified sources with the potential to cause or contribute to ambient levels in exceedence of a threshold adverse health effects, the staff suggested that certain emission levels be designated as review levels. Sources with emissions in excess of these review levels would be subject to the new and modified source review policy. According to the proposed policy, the review level for sources of Class A contaminants should be zero and for sources of Class B contaminants the review level should reflect the adverse health effect threshold of each compound.

Information Requirements --

The proposed policy listed several types of information about a new facility that may be needed to make a decision on permit approval or disapproval. Information in addition to what is routinely required under the existing review process may be necessary for sources of toxic air contaminants. Some of the information that may be required includes,

"a) the availability of alternative processes or substitute compounds of a non-toxic nature; and

b) an estimation of the existing ambient level of any Class B toxic air contaminant to be emitted; and an analysis of the stability, persistence, transformation products, dispersion potential, and other physical and chemical characteristics of those compounds.

c) the number of persons in the area impacted by the source's emissions, and projected population growth for that area;

d) any facility for sensitive subgroups located in the area impacted by the source's emissions, such as schools, hospitals, and convalescent homes; and

e) the availability of alternate sites within the district, the population and sensitive subgroups exposed at those sites, and projected population growth for those sites."(4)

If the applicant cannot provide the necessary information, the district may need to check other sources such as environmental impact reports or other public sources of information.

Determination of Appropriate Controls --

The determination of the appropriate level of control would be made on a case-by-case basis for all new and modified sources of air toxics. This determination would be based on the classification of the toxic air contaminant to be emitted and on particular characteristics of the source.

The control objective for Class A contaminants is to minimize public exposure in all cases and to eliminate public exposure whenever possible. Therefore, the first control consideration for Class A substances would be the feasibility of closed system engineering or other control technology that achieves complete control. The substitution of a non-toxic compound for the Class A compound would also be acceptable. If complete emission control is not achievable and no substitute compound is available, a case-by-case determination should be made of the control technology which achieves the lowest emission level possible and the lowest public exposure. In no case should any new or modified source of a Class A contaminant be required to use less than the best available control technology.

If there are emissions remaining after all control requirements have been applied, the source would be required to use any available offsets for that toxic air comtaminant. The offsets must be for the same compound, at the same source, and share the same impact zone as the point of new emissions. These offsets would be available when more stringent control than that required is achieved from other emission points at that source. Alternative siting to reduce public exposure to the remaining emissions could also be considered. In the event that, after all available controls have been applied, the remaining emissions of the Class A compound still, in the judgment of the permitting agency, constitute an unreasonable public health risk, the permit should be denied.

The staff recommended that all new or modified sources of Class B compounds should be required to use the degree of control necessary to ensure that emissions from those sources do not result in ambient levels which exceed the adverse health effect threshold for the Class B compound emitted. If, after application of the best available control technology, remaining emissions would result in exceedance of the adverse health effect threshold, available offsets could be used. The offsets must be for the same compound, at the same source, and share the same impact zone as the new emissions. If the proposed Class B source cannot reduce its emissions to a level not exceeding the adverse health effect threshold, the permit should be denied.

Monitoring --

To ensure protection of public health, the ARB staff pointed out that districts may want to consider post-construction ambient monitoring, continuous emission monitoring, or real-time reporting.

Public Comment --

The staff recommended a 30-day review and comment period and, when appropriate, a public hearing on any permit decision for a source of toxic air contaminants.

Suggested Control Measures

The staff proposed that the existing "suggested control measure" (SCM) process explained here in the description of the ARB staff divisions be expanded to include technologies to control toxic air contaminants. In this process, the Technical Review Group, composed of ARB and APCD representatives, would identify the appropirate degree of control and suggested control measures for control of toxic emissions from industrial processes.

Development of Ambient Air Quality Standards

The staff pointed out that while it would be impossible to develop ambient standards for the hundreds of potentially toxic compounds used in California, ambient standards are appropriate for pollutants emitted from numerous diverse sources throughout the state or for substances formed in the atmosphere from emissions of precursors. The staff predicted that few ambient standards would be set for toxic substances.

Attainment of ambient standards would be the responsibility of the APCD's. The districts would develop programs including setting emission limits to control emissions from specific sources under their jurisdiction.

ADMINISTRATIVE ISSUES

Other factors important to California's proposed program can be grouped together under the general heading of Administrative Issues. These include the role of outside involvement, air toxics efforts to date, and the level of effort required to develop the proposed program.

Outside Involvement

The staff emphasized that all four steps of the recommended approach must include ample opportunity for comment by affected industry, public health authorities, and the public. The public in California is concerned about exposure to toxic chemicals and has been guaranteed by the State the right to know about risks associated with exposures. The staff stressed that the best available scientific information must be sought and all procedural and administrative requirements must be strictly observed.

The proposed program has benefited from involvement by scientific experts outside of State agencies. For example, an *ad hoc* committee of chemical carcinogen experts from academia and a consulting firm was formed in 1977. The committee made several suggestions to ARB in its 1979 report. In January 1982, ARB sponsored a meeting of experts familiar with regulating, testing, and evaluating carcinogenicity and mutagenicity. This meeting was an important step for ARB in understanding the scientific background for an air toxics control policy.

Level of Effort

In the year prior to the publication of this report, 25 CARB staff positions have been devoted to several aspects of air toxics. The proposed regulations were developed over a period of about 1 year with the involvement of approximately 3 to 4 staff members.

Efforts to Date

Research, Studies, and Monitoring --

The ARB staff has taken several actions towards controlling toxic air contaminants in addition to developing the proposed program. These actions include isolated control efforts, research projects, staff studies, and ambient monitoring. ARB(1) listed six isolated instances in which the staff limited public exposure to toxic air contaminants. These instances included evaluation of proposed incineration of PCB's, decontamination of trichloroethylene contaminated water, adoption of an air quality standard for vinyl chloride, investigations of the feasibility of incinerating hazardous waste solvents, study of air quality impacts from hazardous waste landfills, and development of siting criteria for ethylene dibromide fumigation chambers.

In addition to these specific control efforts, ARB has undertaken several research projects to develop information on source types and associated toxic air contaminants in California. One of the major projects is composed of four parts. The first part was the identification of 5 to 10 carcinogenic substances of greatest potential concern as atmospheric pollutants in California. The 11 carcinogens identified in this part of the study were arsenic, asbetos, benzene, cadmium, carbon tetrachloride, chloroform, ethylene dibromide, ethylene dichloride, nitrosamines, perchloroethylene, and polycyclic aromatic hydrocarbons. The other parts of the study were the identification of areas and sources of specific carcinogens within the state, the establishment of emission factors, and the collection of data for development of control measures.

The 11 carcinogens identified in the first part of this study were selected from the NIOSH list of 2415 chemicals(9) which have reported neoplastigenic or carcinogen effects or neoplastigenic potential. A four-step screening process was developed to make the best use of readily available data. In the first step, eight compliations of known and suspected carcinogens were reviewed and those substances that were not used in California, were highly unstable in air, or were very doubtfully carcinogenic were eliminated. Next, after more detailed information was collected for the remaining 25 substances, the substances were ranked by two different analytical approaches. In the third step, an expert panel reviewed the information on each substance and ranked them independently from the analytical ranking. In the final step, eleven substances were selected from the substances that ranked highest in all three approaches.(10)

In addition to the research efforts, the ARB staff has conducted studies on toxic emissions and available control technologies. In March 1981, the staff completed a study on airborne concentrations of PCB's and the feasibility of incinerating stored PCB's. In February 1982, the staff completed a study on volatile and toxic organic compound emissions from hazardous waste disposal facilities.

ARB has instituted a pilot program of ambient air sampling to determine the ambient levels of potentially toxic materials. Ambient data are being collected for eight halogenated carbon compounds at sites in the Los Angeles area during summer and winter and during episodes of the Santa Ana wind.

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SECTION 10

AIR TOXICS CONTROL STRATEGIES:
STATE OF TEXAS

BACKGROUND INFORMATION

Initiation of Air Toxics Control

In 1967 the Texas State Legislature enacted the Texas Clean Air Act. The Texas Clean Air Act established the Texas Air Control Board (TACB) and directed TACB to develop a plan to control air pollution. The Texas Clean Air Act gave TACB the authority to conduct emissions inventories, to perform research and other investigations, to prescribe monitoring requirements, to adopt rules and regulations, and to enforce these regulations. The Texas Clean Air Act makes a distinction between air contaminant and air pollution. Air contaminant is defined as "particulate matter, radioactive material, dust, fumes, gas, mist, smoke, vapor, or odor, or any combination thereof produced by processes other than natural."[1] Air pollution is broadly defined as:

> "the presence in the atmosphere of one or more air contaminants or combinations thereof in such concentration and of such duration as are or may tend to be injurious to or adversely affect human health or welfare, animal life, vegetation or property, or as to interfere with the normal use and enjoyment of animal life, vegetation or property."[1]

The Texas Clean Air Act stated that the terms and provisions of any rules or regulations adopted by TACB may differ among particular conditions, sources, and areas of the state. The Texas Clean Air Act directed TACB to consider the following factors in establishing rules and regulations:

"(1) the character and degree of injury to, or interference with, the health and physical property of the people;

(2) the social and economic value of the source;

(3) the question of priority of location in the area involved; and

(4) the technical practicability and economic reasonableness of reducing or eliminating the emissions resulting from the source."[1]

The Texas Clean Air Act also states than any proposed facility must utilize the best available control technology (BACT) in order for a permit to be granted.

Enabling Legislation

Under the authority of the Texas Clean Air Act, TACB developed Regulation VI, "Control of Air Pollution by Permits for New Construction or Modification." Regulation VI, which applies to both criteria and noncriteria pollutants, became effective on June 18, 1971. Regulation VI requires all proposed new or modified sources of criteria or noncriteria pollutants to obtain permits to construct from TACB. There are approximately 129 specific exemptions to Regulation VI which include appliances for domestic use, some storage tanks, and combustion units designed for comfort heating systems. However, one exemption is very important from an air toxics standpoint, as will be discussed in subsequent sections of this report. This "generic" exemption applies to any new facility and any repairs, changes, or revised operating procedures not specifically addressed by TACB's exemption list, provided that all of the following criteria are met:

"(1) The emissions from the facility will not contain compounds listed as hazardous constituents in Federal Regulation 40 CFR 261, Appendix VIII. [Identifies substances subject to the notification requirements of the Resource Recovery and Conservation Act (RCRA)]

(2) The new or increased emissions of all air contaminants will not exceed 3 pounds per hour, 50 pounds per day, and 5 tons per year.

(3) The emissions from the facility will not cause or contribute to a condition of "air pollution" as defined in the Texas Clean Air Act.

(4) There will be no visible fugitive emissions from the facility.

(5) There will be no changes to any air pollution control equipment.

(6) The facility will emit no compounds with an odor threshold of less than 1 ppm."[2]

Regulation VI also requires sources of criteria and noncriteria pollutants to obtain a permit to operate after the installation, construction, etc., is completed.

As mentioned above, Regulation VI pertains to both criteria (sulfur oxides, carbon monoxide, nitrogen dioxide, ozone, hydrocarbons, lead and particulate matter) and noncriteria pollutants. Furthermore, emissions of criteria and noncriteria pollutants from a particular source are covered in a single permit. Criteria and noncriteria pollutants are evaluated differently in TACB's permitting process, however. This report focuses only on TACB's policy for permitting sources of noncriteria pollutants and pollutants which, although they may fall under the general classification of hydrocarbon or particulate matter, are not specifically controlled by any State or Federal regulation.

Although among TACB regulations, Regulation VI has the greatest impact on the control of toxics substances, other regulations also impact the control of specific toxic compounds. Regulation II pertains to the control of hydrogen sulfide and sulfuric acid mist, as well as sulfur dioxide;

Regulation III pertains to the control of beryllium and inorganic fluoride compounds. The State Implementation Plan (SIP) pertaining to the control of particulate matter and VOC in nonattainment areas also impacts the control of air toxics.

State Organization for Control of Air Toxics

The Texas Air Control Board is composed of nine members appointed by the Governor of Texas and confirmed by the Senate. These members cannot be removed except for cause and they can be reappointed. The members of the Board serve staggered six-year terms, with the term of three members expiring in each odd-numbered year. The nine-member board must include: a professional engineer with ten years experience some of which must include work in air control; a licensed physician with experience in the field of industrial medicine; a person actively engaged in the management of a private manufacturing or industrial concern for at least ten years; an agricultural engineer with 10 years experience; and five members chosen to represent the public interest. The Board members are not salaried employees of the State but are reimbursed for expenses incurred while in attendance at Board meetings. The Board elects its own chairman and meets approximately 11 to 12 times per year.

The Board appoints the Executive Director who is head of the TACB staff and who is the Chief Executive Officer of the agency. The TACB staff maintains four programs further divided into ten divisions, all of which are housed in the TACB headquarters. The two programs most directly influencing air toxics control are Standards and Regulations and Control and Prevention. The divisions within these programs that deal with air toxics are Control Strategy; Abatement Requirements and Analysis; Permits; and Compliance.

The TACB has twelve regional offices in Texas. These regional offices assist the TACB Central Office in permitting sources of criteria and noncriteria pollutants. In addition, there are eight local agencies which have concurrent authority with the TACB to enforce TACB regulations within their jurisdictions. The regional and local offices initiate action concerning existing sources of criteria or noncriteria air contaminants that may be causing a condition of air pollution.

Summary of Air Toxics Policy for Noncriteria and Toxic Pollutants

All proposed new or modified sources, except those specifically exempted under the 128 standard exemptions or meeting the "generic" exemption, must obtain permits to construct. The Texas Clean Air Act broadly defines "modification" as:

> ". . . any physical change in, or change in the method of operation of, a stationary source which increases the amount of any air pollutant emitted by such source into the atmosphere or which results in the emission of any air pollutant not previously emitted. Insignificant increases in the amount of any air pollutant emitted are not intended to be included, nor is maintenance or replacement of equipment components which do not increase or tend to increase the amount or change the characteristics of the air contaminants emitted to the atmosphere."[1]

Since the inception of its permitting activities, the TACB staff has reviewed permits involving over 1000 distinct noncriteria or toxic pollutants. A source's permit application includes information on potential contaminants and emission rates, and proposed methods of control. TACB reviews each permit application on a case-by-case basis. TACB checks the validity of emission rates by comparing them to emissions rates from existing similar source types or by conducting an engineering analysis of the process. TACB then uses dispersion modeling to predict the ambient concentration which would result from the estimated emission rates. The calculated ambient concentrations are compared to threshold levels for detailed review established by TACB. These thresholds for detailed review are typically, but not always, 1 percent of the Threshold Limit Value on a time-weighted average basis (TLV-TWA) for the particular compound in question. The TLV-TWA is defined as "the time-weighted average concentration for a normal 8-hour workday or 40-hour work week, to which nearly all workers can be exposed, day after day, without adverse effect."[3] In other words, the TLV-TWA is designed to protect workers from chronic effects resulting from exposure to certain substances. The American Conference of Governmental Industrial Hygienists (ACGIH), the Occupational Safety and Health Administration (OSHA), and the National Institute of Occupational Safety and Health (NIOSH) each establish TLV-TWA's for a wide variety of substances. TACB examines and evaluates each of these TLV's in its process of setting thresholds for detailed review.

Regulation VI requires that all new or modified sources utilize BACT as determined by TACB. If after the initial BACT review, noncriteria emissions from a particular source result in ambient concentrations lower than TACB's threshold levels, and criteria pollutant emissions meet the requirements that apply to them, the source is granted a permit. If emissions result in ambient concentrations higher than TACB's threshold levels, further evaluation is required before the permit is approved or denied. A permit to construct or operate is approved only when TACB is satisfied that emissions from a particular source do not result in unacceptable ambient concentrations. Because BACT is required for all new sources, further reductions in toxic emissions are usually not required.

Discussions of TACB's dispersion modeling program, threshold levels for detailed review, BACT determinations, compliance testing, and exemptions to the permitting process are included in the following sections of this report. As mentioned previously, TACB has other regulations specific to the control of certain toxic substances. A brief discussion of these regulations also follows.

DETAILED DESCRIPTION OF COMPONENTS OF AIR TOXICS POLICY

Dispersion Modeling

TACB uses dispersion modeling to estimate ambient concentrations resulting from a source's emissions. For acute effects and odors, the permit engineer models worst-case 30-minute public exposures. For chronic effects the engineer models long-term average exposures, usually annual.

Texas has developed two of its own models - Texas Episodic Model (TEM-8) and Texas Climatological Model (TCM). The TEM-8 model is based on averaging times of 10 minutes to 24 hours, whereas TCM is based on annual averages. Meteorological data is inputted to TEM-8 every hour, while TCM uses annualized meteorological data. Input to the models includes wind direction, wind speed, mixing height, potential temperature gradient, emission rates, source height and diameter, exit velocity, exit temperature, and stack flow rate. The models can handle inputs of up to 300 point sources and 2500 receptor locations. The mathematical models are based on steady state Gaussian plume hypothesis; Briggs plume rise formulations; and Pasquill-Gifford dispersion coefficient approximations. Choice of urban or rural dispersion coefficient is an option in both models.

Development and Use of Thresholds for Detailed Review

TACB collects toxicity information for noncriteria pollutants and informally tabulates this information for each reference (see Appendix F). The table is continuously updated to include the most recent toxicity data and information. Information collected includes TLV's established by ACGIH, OSHA, and NIOSH; odor threshold values; carcinogenicity and mutagenicity data; and information on other acute and toxic effects. A list of literature sources typically examined by TACB is also given in Appendix F. Using the information gathered during these toxicity data reviews, TACB establishes acceptable ambient level guidelines for each noncriteria pollutant it considers.

For substances not known or suspected to be carcinogenic or mutagenic, TACB typically adopts threshold levels of 1 percent of the TLV.[4] If no TLV has been established for a particular substance, TACB relies on other toxicity data or TLV's for similar substances. However, TACB treats substances known or suspected to be carcinogens or mutagens differently. In dealing with carcinogens and mutagens the TACB staff feels that it is not possible to establish threshold levels below which there is no effect. However, TACB also believes that, the lower the exposure, the lower will be the probability of effect on exposed individuals. Consequently, TACB requires very stringent application of BACT to sources of carcinogens and mutagens. In some cases, information concerning typical ambient levels of a particular carcinogen or mutagen in urban areas may be available. If so, the TACB staff expects the contribution from the permit unit to be reduced to levels no greater than the ambient levels implicitly accepted by society. Thresholds for detailed review for substances with low odor thresholds are also likely to be lower than 1 percent of the TLV.

The threshold level for a substance is reviewed each time that particular substance is identified as an emission in a permit application or when additional toxicity information becomes available. A previously set threshold level may be revised to reflect new toxicity information. Thus, two sources emitting the same substance may be allowed different ambient concentrations, depending upon when they were permitted. There may also be differences in allowable ambient levels due to the fact that TACB recently altered its approach to developing thresholds for detailed review. Until the end of 1979, TACB typically used threshold levels of 1 percent of the TLV for some substances and 3 percent of the TLV for other substances. The 1-percent-of-TLV threshold level was used if the toxic effect to be prevented was an acute effect, such as irritation that might result from short-term exposure; or if the toxicity information indicated that the exposure level recommended for a healthy adult was not fully protective; or if the effects were relatively severe.[5] The 3-percent-of-TLV threshold level was typically used to protect against chronic effects.

TACB emphasizes that its thresholds for detailed review are not standards. A source whose emissions result in ambient concentrations less than the threshold level will be granted a permit provided BACT control is in place and criteria pollutant emissions meet all applicable requirements. However, if the resulting ambient concentration exceeds the threshold level, further evaluation is necessary. The purpose of this evaluation is to determine whether emissions and resulting ambient concentrations are at "safe" levels. TACB considers the protectiveness of the TLV used; the ambient concentration as determined by modeling; the type of potential adverse effect; and the population distribution around the proposed facility. The emissions and resulting ambient concentrations are then classified as being acceptable, undesirable, or marginal. If the levels are described as undesirable or marginal, the permit engineer normally requests that the applicant modify the proposed design of the permit unit to reduce modeled exposures to an acceptable level. These further reductions are routinely achieved.

Determining BACT

Every proposed new or modified source is required to submit process design plans for control in its permit application. TACB then determines whether the proposed unit design and method of control constitute BACT. BACT is determined by TACB on a case-by-case basis taking into consideration the technical feasibility and economic reasonableness of reducing or eliminating emissions from the facility. The potential effects of the pollutants on human health, property, and the environment also have a bearing on what constitutes BACT. Also, BACT for a modified source might differ from that for a new source due to age, size, and space limitations because of cost considerations. The TACB evaluates New Source Performance Standards (NSPS) and Reasonably Available Control Technology (RACT) determinations established by EPA, BACT determinations made by other states, and the technical literature in making a BACT determination for a permit application. Determining BACT often requires negotiation between TACB and the affected facility. For instance, sometimes a facility claims that the type of control it has proposed can achieve results equal to those of a unit design and control combination considered to be BACT by TACB. In such cases, TACB may grant a permit to construct, making it clear to the applicant that a permit to operate will not be granted unless compliance with the specified emission rate is achieved.[6] This "compliance" provision, included in Regulation VI, applies to all facilities undergoing the permitting process.[2]

Compliance Testing

Regulation VI includes a provision whereby a source can be required to verify performance claims and emission rates prior to the approval of a permit to operate. Furthermore, the Texas Clean Air Act gives the Executive Director of TACB the authority to require stack testing for any facility at any time. The TACB has stated that in most cases compliance testing is required before a permit to operate is granted.

Exemptions

TACB has 129 exemptions to its permitting process.[a] Many of the standard exemptions are in effect standard permits that are granted if the permit unit has applied what has been determined to be BACT, and if the resulting emissions and ambient impacts are small. Although most of these exemptions pertain to specific sources, there is one generic exemption based on emission rates and certain generalized requirements. TACB has stated that this exemption aids both TACB and industrial facilities. Industrial facilities that meet the exemption are allowed to begin construction or modification almost immediately, whereas facilities that are not exempt are subject to the often lengthy permitting process. Thus, the standard exemptions provide an incentive for industrial facilities to include efficient process and control designs. Having the standard exemptions also decreases the time which would otherwise be spent by TACB in reviewing sources which make a very small contribution to air contaminant emissions. Furthermore, TACB claims that the results achieved by allowing specific standard exemptions are at least as good as case-by-case review. Since the applicant for an exemption must identify the substances emitted, even those units exempted under the generic exemption are reviewed for toxic substance impact.

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[a] TACB's list of exemptions from permit procedures is reviewed and revised annually. Information concerning this list, "Exemptions from Permit Procedures," may be obtained from: Texas Air Control Board, Permits Division, 6330 Highway 290 East, Austin, Texas 78723, (512) 451-5711.

Other Regulations

Regulation VI addresses air toxics emissions through the permitting process. Moreover, since the majority of air toxics fall under the categories of particulate matter or VOC, State emission requirements impact air toxics emissions in nonattainment areas of the State. Some of these requirements are SIP requirements and some, such as the opacity limitations, apply statewide. For example, in several parts of the State, large or readily combustible vent gas streams containing certain volatile organic compounds must be incinerated at a temperature of at least 1300°F in a smokeless flare or direct flame incinerator, or controlled by some similarly effective means. This requirement applies to both specific compounds (ethylene, butadiene, isobutylene, styrene, isoprene, propylene, α-methylstyrene) and general classes of compounds (aldehydes, alcohols, aromatics, ethers, olefins, peroxides, amines, acids, esters, ketones, sulfides, and branched chain hydrocarbons with eight or more carbon atoms). This rule was written with the expectation that it would control emissions contributing to photochemical smog, secondary aerosols, and ozone, and that some of the chemicals thus controlled would be toxic or maloderous. TACB points out that this requirement for vent gas streams, adopted in 1973, required the abatement of about two-thirds of the vinyl chloride emitted in the State, before it was known that vinyl chloride was a carcinogen.

In addition to Regulation VI and SIP requirements, TACB has two other regulations that can potentially impact the control of air toxics. Each of these regulations is briefly discussed below.

Regulation II--

Regulation II, "Control of Air Pollution from Sulfur Compounds," deals with emissions of sulfur dioxide (a criteria pollutant), hydrogen sulfide, and sulfuric acid mist. The portions of the Regulation pertaining to hydrogen sulfide and sulfuric acid have been in effect since December 19, 1973. For hydrogen sulfide, the following restrictions apply. These restrictions explicitly control H_2S emissions in populated areas rather than in unpopulated areas:

(1) No person may cause, suffer, allow, or permit emissions of hydrogen sulfide from a source or sources operated on a property or multiple sources operated on contiguous properties to exceed a net ground level concentration of 0.08 ppm averaged over any 30-minute period if the downwind concentration of hydrogen sulfide affects a property used for residential, business, or commercial purposes.

(2) No person may cause, suffer, allow, or permit emissions of hydrogen sulfide from a source or sources operated on a property or multiple sources operated on contiguous properties to exceed a net ground level concentration of 0.12 ppm averaged over any 30-minute period if the downwind concentration of hydrogen sulfide affects only property used for other than residential, recreational, business, or commercial purposes, such as

industrial property and vacant tracts and range lands not normally occupied by people.[8]

The segment of Regulation II pertaining to sulfuric acid states that:

> "No person may cause, suffer, allow, or permit emissions of sulfuric acid from a source or sources operated on a property or multiple sources operated on contiguous properties to exceed:
>
> (1) a net ground level concentration of 15 μg per cubic meter of air averaged over a one-hour period of time more than once during any consecutive 24-hour period;
> (2) a net ground level concentration of 50 μg per cubic meter of air averaged over a one-hour period of time more than once during any consecutive 24-hour period; or
> (3) one hundred μg per cubic meter of air maximum at any time.[8]

The methods used to calculate the downwind concentrations of hydrogen sulfide and sulfuric acid are also described in Regulation II.

Regulation III--

Regulation III, "Control of Air Pollution from Toxic Materials", covers emissions from inorganic fluoride compounds and beryllium. The TACB control of beryllium dates from 1967. The limits on fluoride were adopted in 1969. TACB defines "inorganic fluoride compounds" as "all inorganic chemicals having an atom or atoms of fluorine in their chemical structure."[9] Regulation III establishes a limit on the emission of gaseous inorganic fluoride compounds from a single property. These emissions, calculated as hydrogen fluoride, must not exceed six parts per billion by volume average during a period of three consecutive hours.[9] The contribution of inorganic fluoride compounds by a single property is measured by the difference between the upwind level and the downwind level, or by stack sampling results used to calculate a downwind concentration.

For beryllium, TACB has established a limit on the emission of beryllium from a single property not to exceed 0.01 microgram average per cubic meter of air during any 24-hour period of time.[9] The concentration of beryllium is measured in the manner prescribed above for inorganic fluoride compounds.

ADMINISTRATIVE ISSUES

The TACB has recently established a Research Advisory Council, composed of scientists and members of the community, to assist it in long-term research planning. It is expected that this Council will assist in determining what data will be needed 10 to 20 years in the future and establishing an approach for obtaining this data.[4]

Regulation VI has been in effect for slightly over ten years and during that time over 9000 facilities, many of which contain multiple sources, have received permits to construct. Approximately 300 permits are issued each year through the new source review process. Another 1200-1400 standard exemptions, or standard permits, are also issued each year with less than 20 of these falling under the "generic" exemption.[11] Since TACB's inception approximately 25 permits to construct have been denied.[10] There have been several legal challenges to both individual permits and to the permitting system in general. Thus far, TACB has been upheld by the Texas Supreme Court in all cases that have reached it.[10] To date there have not been any legal challenges to either the use of TLV's in TACB's process of using a threshold for detailed review or to the case-by-case determinations of whether public exposures to certain concentrations of noncriteria air contaminants are acceptable.[11]

The TACB is actively involved in conducting statewide monitoring for metals and total extractable organics in particulate matter. Monitoring has been completed in Houston (and a control area) for 20 compounds; this monitoring program was initiated due to public complaints about rashes.

TACB has an extensive emissions inventory of specific organic substances, but this inventory so far has not been used in making any policy- or research-related decisions.

TACB is assisted by its regional offices in permitting and in the identification of "nuisances." TACB handles all permits to construct but the regional offices typically handle permits to operate. A permit to operate does not require extensive review and is generally approved provided all the conditions specified in the permit to construct are satisfied. The TACB regional offices or the local agencies also investigate all complaints about existing sources. TACB typically receives about 1-2 such "nuisance" complaints each week for toxic substances. Incidentally, "nuisance" is synonomous with "air pollution" by definition of the Texas Clean Air Act and the TACB General Rules. It is TACB's policy to respond to all complaints and to report findings to the party addressing the complaint.

Although TACB's air toxics policy does not deal specifically with existing sources, TACB can review existing sources if such review is warranted. Several years ago, when the carcinogenicity of vinyl chloride was determined, TACB required all existing vinyl chloride emission sources to achieve additional control. This action was taken prior to the establishment of a National Emission Standard for Hazardous Air Pollutants (NESHAP) for vinyl chloride.

CONTACTS

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Austin, Texas 78723
(512) 451-5711

JoAnn Wiersema
(Development of Acceptable Ambient Level Guidelines)

James Myers
(Permitting)

James Price
(Regulations and Policy)

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2. Texas Air Control Board. 31 Texas Administrative Code Chapter 116. Regulation VI. Control of Air Pollution by Permits for New Construction or Modification. Austin, Texas. Revised March 20, 1981.

3. American Conference of Governmental Hygienists (ACGIH). Threshold Limit Values (TLV's) for Chemical Substances in Workroom Air. Cincinnati, Ohio. 1980. pp. 2-4.

4. Telecon. Call, S. J. (Radian Corporation) with J. Wiersema (TACB). July 8, 1982.

5. Price, J., J. Wiersema; and J. Hartfield (TACB). "New Source Review for Acceptability of Public Exposure to Chemical Emissions." (Presented at the 72nd Annual Meeting of the Air Pollution Control Association, Cincinnati, Ohio. June 24-29, 1979).

6. Telecon. Call, S. J. (Radian Corporation) with J. Price (TACB). August 12, 1982.

7. Texas Air Control Board. 31 Texas Administrative Code Chapter 113. Regulation V. Control of Air Pollution from Volatile Organic Compounds. Austin, Texas. Revised January 8, 1982.

8. Texas Air Control Board. 31 Texas Administrative Code Chapter 112. Regulation II. Control of Air Pollution from Sulfur Compounds. Austin, Texas. Revised December 14, 1979.

9. Texas Air Control Board. 31 Texas Administrative Code Chapter 113. Regulation III. Control of Air Pollution from Toxic Materials. Austin, Texas. Revised March 20, 1981.

10. Telecon. Call, S. J. (Radian Corporation) with J. Myers (TACB). August 2, 1982.

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APPENDIX F

INFORMATION COLLECTED AND TABULATED BY TEXAS IN ITS GUIDELINE DEVELOPMENT PROCESS

EXAMPLES OF TYPES OF TOXICITY INFORMATION WE COLLATE AND UPDATE FOR USE IN REVIEWING COMPOUNDS:[a]

	NAME OF SUBSTANCE synonym	GROUP	CODE *	STANDARDS TLV--ACGIH ppm	(mg/m³)	OSHA ppm	(mg/m³)	NIOSH recom ppm	(mg/m³)	#-NIOSH Registry Toxic Subs	CARCINOGENICITY & GENOTOXICITY INFORMATION	OTHER TOXICITY INFORMATION AND COMMENTS
415	Hexafluoroacetone		.08	.1	(.7)	—	—	—	—	UC2450000	none	Sax - very irritating. ter-skn/rat.
416	Hexamethylene diamine		2	—	—	—	—	—	—	MO1180000	none	Sax-irrit. 2,-,-,-; Sax-inhal. -,2,-,-;
417	Hexamethyl phosphoramide		2	A2 —	—	—	—	—	—	TD0875000	'77 IARC animal positive	Unknown.
418	Hexane syn: n-Hexane		.03	100	(360)	500	(1800)	1800mg,15 min ceiling	(350)	MN9275000	none	Sax-irrit. 1,-,1,-; Sax-inhal. -,1,-,-;
419	2-Hexanone syn: Methyl butyl ketone		.03	25	(100)Sk	100	(410)	1	(4)	MP1400000	none	Sax-irrit. 2,-,-,-; Sax-inhal. -,3,-,3; neurotoxic.
420	1-Hexene syn: Hexylene*Butyl ethylene		2	—	—	—	—	—	—		none	Sax-irrit. 2,-,-,-; Sax-inhal. -,2,-,-;
421	Hexone syn: Methyl isobutyl ketone	O	.09	100	(410)Sk	100	(410)	50	(200)	SA9275000	none	Sax-irrit. 2,-,-,-; Sax-inhal. -,3,-,-; Standard not low enough.
422	sec-Hexyl acetate syn: Methyl isoamylacetate * 1,3-Dimethyl butyl acetate		.03	50	(300)	50	(300)	—	—	[illegible]	none	Unknown.
423	Hexylene syn: 1-Hexene* Butylethylene		2	—	—	—	—	—	—		none	Sax-inhal. -,2,-,-; Sax-irrit. 2,-,-,-;
424	Hydrazine		2	A2 .1	(.1)Sk	1	(1.3)Sk	2hr. ceiling .03	(.04)	MU7175000	IARC '74 animal carcinogen	Sax-irrit. 3,-,-,-; Sax-inhal. -,3,-,3; Sax-allergn. -,-,2,-;
425	Hydrogen		6	inert gas		—	—	—	—	[illegible]	none	Sax-inhal. 0,1,0,0;
426	Hydrogenated terphenyls		.03	.5	(5)	—	—	—	—		none	Sax-inhal. -,2,-,-;
427	Hydrogen bromide		.08	3	(10)	3	(10)	—	—	[illegible]	none	Sax-irrit. 3,-,2,-; Sax-inhal. -,3,-,2;
428	Hydrogen chloride		.08	5	C (7)	5	C (7)	—	—	[illegible]	none	Sax-irrit. 3,-,2,-; Sax-inhal. -,3,-,-;

*These codes were chosen at previous reviews. They are redetermined each time a compound is considered.

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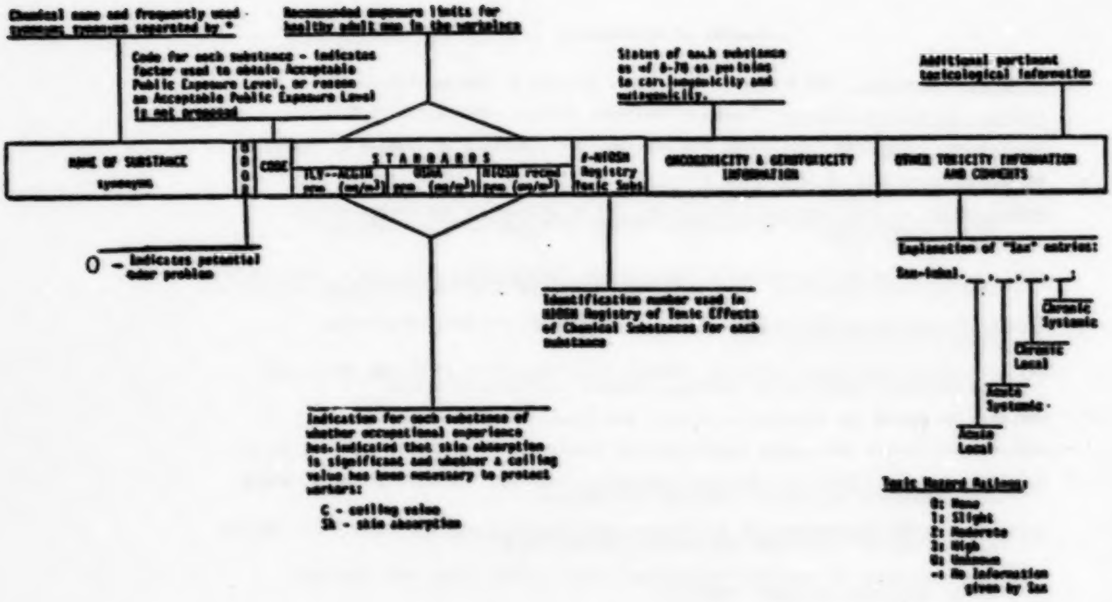
[a] Price, J., J. Wiersema, J. Hartfield (TACB). "New Source Review for Acceptability of Public Exposure to Chemical Emissions." (Presented at 72nd Annual APCA Meeting, Cincinnati, Ohio; June 24-29, 1979.)

EXPLANATION OF LIST FORMAT


Chemical name and frequently used synonyms, synonyms separated by *
Recommended exposure limits for healthy adult man in the workplace
Code for each substance - indicates factor used to obtain Acceptable Public Exposure Level, or reason an Acceptable Public Exposure Level is not proposed
Status of each substance as of 8-78 as pertains to carcinogenicity and mutagenicity.
Additional pertinent toxicological information
NAME OF SUBSTANCE
synonyms
ODOR
CODE
STANDARDS
TLV--ACGIH ppm (mg/m³)
OSHA ppm (mg/m³)
NIOSH recmd ppm (mg/m³)
#-NIOSH Registry Toxic Subs
ONCOGENICITY & GENOTOXICITY INFORMATION
OTHER TOXICITY INFORMATION AND COMMENTS
O - Indicates potential odor problem
Identification number used in NIOSH Registry of Toxic Effects of Chemical Substances for each substance
Explanation of "Sax" entries:
Sax-Inhal. __, __, __, __;
Chronic Systemic
Chronic Local
Acute Systemic
Acute Local
Indication for each substance of whether occupational experience has indicated that skin absorption is significant and whether a ceiling value has been necessary to protect workers:
C - ceiling value
Sk - skin absorption
Toxic Hazard Ratings:
0: None
1: Slight
2: Moderate
3: High
U: Unknown
-: No information given by Sax

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SECTION 11

AIR TOXICS CONTROL STRATEGIES:
STATE OF ILLINOIS

BACKGROUND INFORMATION

Initiation of Air Toxics Control

The Illinois Environmental Protection Agency (IEPA) is considering an air toxics program designed to reduce uncertainties and inconsistencies associated with air toxics control.(1) IEPA is developing an air toxics program in response to the increasing demands on public and private resources, the uncertainty now associated with air toxics control, and the significant potential hazards associated with such pollutants.

The program being considered by IEPA attempts to address three problems. First is the Agency's need for information on the emissions of potentially toxic chemicals. Second is the need to provide industry with definite guidelines that the State will follow in permitting sources of air toxics. Such guidelines will reduce the uncertainties of the industry's capital investment and production planning decisions. The third problem is the possibility that without more complete emissions information, air toxics regulation could be the result of public panic rather than being based on sound scientific information and hazard evaluation.(1)

Enabling Legislation

The enabling legislation for the control of toxic air pollutants in Illinois is the general authority granted in the Illinois Environmental Protection Act, passed in 1970 and most recently amended in 1981. This Act defined "air pollution" and "contaminant" and established the Illinois Environmental Protection Agency and the Pollution Control Board. The Board is composed of 5 "technically qualified" members appointed by the Governor. The act granted the Board powers including the authority to promulgate standards, rules, and regulations and to issue construction, installation, and operation permits.

The Act broadly defined "contaminant" as "any solid, liquid, or gaseous matter, any odor, or any form of energy, from whatever source."(2) "Air pollution" is defined in the Act as,

> "the presence in the atmosphere of one or more contaminants in sufficient quantities and of such characteristics and duration as to be injurious to human, plant, or animal life, to health, or to property, or to unreasonably interfere with the enjoyment of life or property."(2)

The Board adopted similar general definitions of these two terms in their rules and regulations.(3) Neither the legislation nor the Board's rules and regulations specifically mentions toxic air emissions. Rather, the authority for controlling air toxics is part of the general mandate from the Environmental Protection Act and the Board's rules not to grant a permit for the operation of an air pollution emission source that might threaten public health or unreasonably interfere with the enjoyment of life or property.

OVERVIEW OF APPROACH

Function

The approach being considered in Illinois for regulating air toxics is a framework built around IEPA's ongoing program for issuing construction and operation permits. The program would identify, evaluate, and control emissions of toxic pollutants posing a hazard to public health.

Scope

IEPA recognizes that any pollutant can be toxic depending upon concentration and that the magnitude of a health hazard depends on toxicity of a chemical and the extent of human exposure. Thus, the proposed air toxics program would consider all pollutants as toxic, with the exception of the 15 pollutants covered by specific Pollution Control Board limitations.

Initially the air toxics program will be limited in scope, designed to improve the flow of toxics emission data and establish a rational framework for toxic emissions evaluation and control.

Summary of Approach

IEPA is considering a four-part approach consisting of hazard identification, toxicity evaluation, hazard evaluation, and hazard response. Hazard identification would point out cases where toxic emissions are greatest. Toxicity evaluation refers to an assessment of the toxicity of each substance in question. Hazard evaluation combines information from these first two parts to determine, quantitatively if possible, the actual public hazard that exists. The final part, hazard response, involves determining the appropriate response for the magnitude of the hazard.

These four parts would be accomplished by procedures to identify and evaluate permit applications for sources posing significant health risks.

EXPLANATION OF APPROACH

Permit Identification

Permit identification activities would include collection of toxic emissions data from sources most likely to pose a health hazard. Three methods are being considered to accomplish this: the priority chemical approach, the priority industry approach, and general source review. IEPA is considering adopting an approach that uses one or more of these methods.

Using the priority chemical approach, permit renewal applicants would provide emission data for chemicals identified by IEPA as either highly toxic or carcinogenic and likely to be emitted in Illinois. In Illinois, permits are valid for a maximum of 5 years. IEPA estimates that only about 50 percent of the sources in Illinois would be required to submit these data because it is extremely unlikely that the remainder would emit any of the listed chemicals. Initially, the priority chemicals would be those listed in Table 8, but additional substances might be added as the need arises.

TABLE 8. PRIORITY CHEMICALS

1. Acrylonitrile
2. Arsenic and compounds
3. Asbestos
4. Benzene
5. Beryllium and compounds
6. Cadmium and compounds
7. Carbon Tetrachloride
8. Chloroform
9. Chromium and compounds
10. Ethylene Dichloride
11. Ethyleneimine
12. Epichlorohydrin
13. Ethylene Oxide
14. Formaldehyde
15. Lead
16. Mercury and compounds
17. Nickel and compounds
18. Vinyl Chloride
19. Vinlidene Chloride

The priority industry approach would concentrate on evaluating permit renewals for facilities in industries having a high potential to emit toxic air pollutants. Table 9 lists such industries.

TABLE 9. PRIORITY INDUSTRIES

1. Organic Chemical Manufacturing
2. Plastics and Synthetics Manufacturing
3. Cement Production
4. Nonferrous Smelting
5. Iron and Steel Manufacturing
6. Oil Refining
7. Inorganic Chemical Manufacturing

If IEPA uses a combination of the three approaches, organic chemical manufacturing would be the only industry evaluated in the first year of the program. If the Agency drops the priority chemical approach, they would consider the first three industries listed in Table 9 in the first year.

The general source review approach lets the Agency request more specific emissions data than would be required by the routine permit application procedure when a potentially hazardous situation arises. This approach would give IEPA additional flexibility to act on urgent problems.

Permit Evaluation

In the permit evaluation process, a source's emission data submitted with the renewal application would be screened to determine if the emissions pose a significant hazard and if that hazard warrants a more detailed review of the source's emissions.

IEPA has identified three hazard classifications: high (level of action), medium to low, or insignificant (level of insignificance). Placement in the high classification would require remedial action. The high classification includes suspected carcinogens with a lifetime probability greater than 1 in 10,000 that a person exposed to the maximum expected ambient concentration will develop cancer. An averaging period of 1 year is used for carcinogenic emissions. The high classification or level of action also includes substances not suspected of being carcinogens if the ambient concentration resulting from the source's emissions is greater than or equal to the threshold limit value (TLV)/100 over a 24-hour averaging period. IEPA uses TLV's developed by the American Conference of Governmental Industrial Hygenists. The TLV is the occupational exposure standard for a chemical and is intended to protect a healthy worker for 8 hours per day, 5 days per week. IEPA defines the upper limit for the level of insignificance by a lifetime cancer risk of 1 in 10 million for carcinogens and, for substances not suspected to be carcinogens, by an ambient concentration resulting from the source's emission of the pollutant of the TLV/300. The moderate to low hazard classification is defined by IEPA by a cancer risk between 10^{-7} and 10^{-4} or an ambient concentration resulting from the source's emissions between TLV/100 and TLV/300.

IEPA is considering U.S. EPA's linear nonthreshold dose/response model for cancer risk assessment.[a] With this approach, the ambient concentration producing a 1 in 10 million cancer risk can be determined by dividing 10^{-7} by the potency value for the carcinogen as calculated by U.S. EPA. This allows consideration of tremendous differences in potencies between carcinogens to be considered.

The permit evaluation process begins with a preliminary screening. For this screening, the source's worst case contribution to the ambient concentration would be estimated for each pollutant using an abbreviated dispersion modeling technique. The modeling results would be compared to the level of insignificance.

If the source's emissions cause the ambient level to exceed the level of insignificance, the permit application would be referred to a Toxics Review Committee composed of representatives from the Division of Air

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[a] Prior to November 1980, U.S. EPA used the linear nonthreshold dose/response model for cancer risk assessment. Since November 1980, U.S. EPA has used the linearized multistage model. Discussions of both models can be found in Reference 4.

Pollution Control's Permits and Air Quality Planning Sections. The Committee would briefly review information on the source such as the control technology already being utilized, proximity and size of the exposed population, and the severity of the potential health hazard associated with exposure. IEPA anticipates that, as a result of the Committee's review, many sources will be determined to pose insignificant hazards because of factors such as distance to the nearest population center.

This screening process is designed to focus resources and attention on the most serious problems. Permit applications with risks exceeding the level of action or considered to pose a significant hazard for other reasons would be considered the top priority and would receive a complete toxics review. Applications involving risks above the level of insignificance but below the level of action would be granted a permit on a short-term basis for 1 to 2 years. The applicant may then have to supply additional data on health hazards and feasibility of emission reduction upon renewal.

Applicants whose permits are determined to be top priority would be asked to submit additional information on health effects. These permits would undergo detailed technology and hazard assessments. The technology assessment would determine the efficiency of the present control technology used, options for reducing emissions, and the relative costs of those options. The hazard assessment would include identification of an appropriate sensitive receptor for dispersion modeling, computerized dispersion modeling with actual meteorological data, evaluation of toxicity data as support for the TLV or the cancer risk assessment, and verification and evaluation of demographic and environmental data such as the size and age distribution of the exposed population and the presence of other sources nearby.

Permit Decision

The Toxics Review Committee would examine data from the technology and hazard assessments to determine if the applicant has demonstrated that emissions will not pose a health hazard or interfere unreasonably with the enjoyment of life or property. The Toxics Review Committee would then recommend to the Permit Section manager that the permit should be granted or denied.

Figure 6 summarizes the air toxics permit review process under consideration in Illinois.

ADMINISTRATIVE ISSUES

Level Of Effort

IEPA pointed out that the initial air toxics program will be of very limited scope. Initially, the program is expected to involve 2 to 3 workyears of the Agency's effort.

Factors Critical to Success

IEPA emphasized four factors critical to the success of any air toxics program. First is that the agency should recognize that resources are limited and that application of resources to insignificant risks will hamper overall hazard reduction. Therefore, the prioritization of potential hazards must be an integral part of the program. The second factor is that the program should begin on a limited scale. IEPA noted that they had neither the resources nor the knowledge to tackle all the problems at once. Third is that the program must be flexible. The approaches used to gather and evaluate information and the approach used to reduce hazards must not be too rigid but must be adaptable to specific circumstances. Finally, any program should be evolutionary in nature due to rapid changes in the quantity and quality of knowledge in the field of toxics.

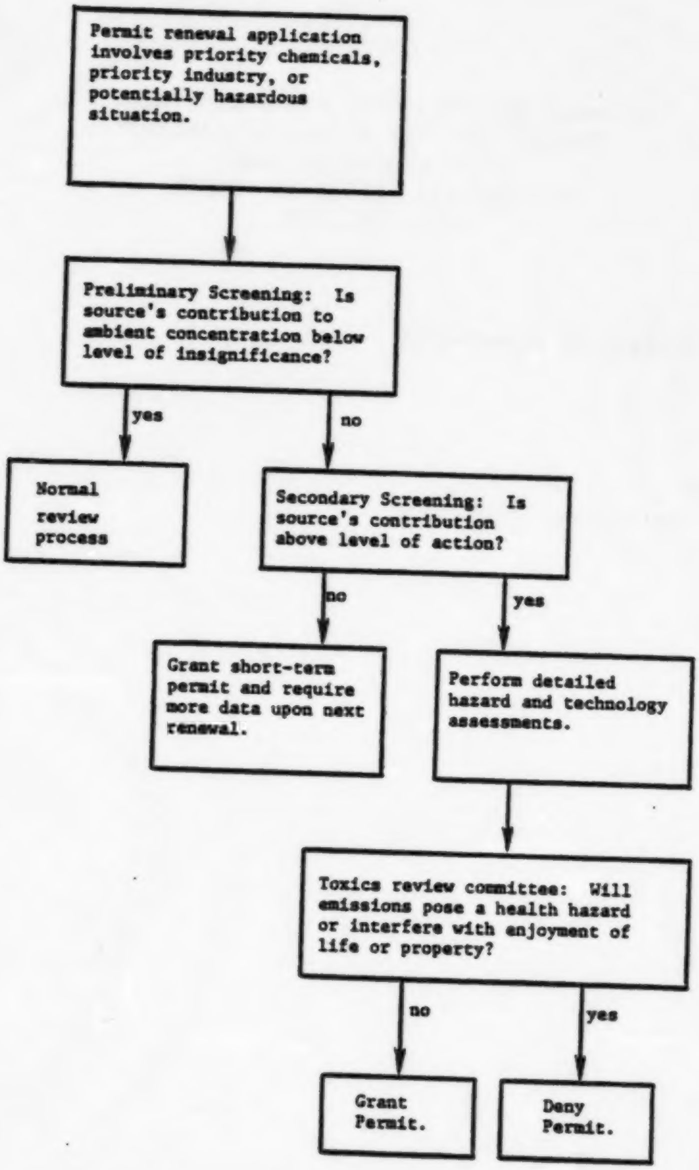
Permit renewal application involves priority chemicals, priority industry, or potentially hazardous situation.
Preliminary Screening: Is source's contribution to ambient concentration below level of insignificance?
yes
no
Normal review process
Secondary Screening: Is source's contribution above level of action?
no
yes
Grant short-term permit and require more data upon next renewal.
Perform detailed hazard and technology assessments.
Toxics review committee: Will emissions pose a health hazard or interfere with enjoyment of life or property?
no
yes
Grant Permit.
Deny Permit.

Figure 6. Air toxics permit review process under consideration in Illinois.

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